

10/10/10

CALCULATION COVER SHEET



Project:	INEEL V-Tank Remediation Project				Number of Sheets: 1 of 28
Site:	Test Area North, Idaho Falls, Idaho.				
Calculation Number:	ABQ11-CE007	Work Order Number:	12393.002.001		
Subject:	INEEL/BBWI Utility Location and Type				
Rev #:	Date:	Revision:	Calculated by:	Checked:	Approved:
RAA	5-11-01	90% Design	Chris Ehram	Dan Brennecke	Berg Keshian
RAB	9-27-01	Draft Final	Chris Ehram	Dan Brennecke	<i>[Signature]</i>

Problem Statement:

Locate all utilities with the area, this includes abandoned in place utilities. Locate the utility by a horizontal and vertical tie to reference point such as a building, the natural ground or a significant structure. Find the material used for these utilities, ie concrete, cast iron, or stainless steel.

Method of Solution: Review Autocad and PDF drawings provided by INEEL and site visit.

Assumptions:

Not all Utilities lines are shown on drawings. The utilities shown on drawings may or may not be as shown and must be field verified.

Sources of Formulas and References:

Autocad and PDF Drawings provided by INEEL, and site visit.

Calculation:

Locate and map utility location and material on design drawings.

Summary of Results:

The location and material type for all utilities was not available on the drawings provided.

The drawings are inconsistent in showing the location of utilities within the area of concern. Often the lines representing a utility are not dimensioned to a building or significant structure therefore leaving room for error. Most of the drawings are in PDF format, therefore scaling off the drawings was not feasible. The drawings provided do not show, gas, propane, electric, or telephone lines.

It is recommended that utility locates be performed prior to excavation, that excavation be done in increments no greater than 12 inches at a time, and that a spotter be provided during remediation/excavation to lessen the chance of breaking lines during excavation.

CLIENT/SUBJECT _____ W.O. NO. _____

TASK DESCRIPTION _____ TASK NO. _____

PREPARED BY _____ DEPT _____ DATE _____

MATH CHECK BY _____ DEPT _____ DATE _____

METHOD REV. BY _____ DEPT _____ DATE _____

APPROVED BY _____

DEPT _____ DATE _____

This drawing shows the location and side of contaminated waste (wc) and concentrated contaminated waste (wcc)

TAN RADIOACTIVE LIQUID WASTE UNDERGROUND PIPING 60T AREA																																											
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This drawing shows the location of Fire water and Utility water site Plan.

TAN/TSF AREA FIRE WATER & UTILITY WATER SITE PLAN																																											
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Drawing shows Radioactive liquid waste underground piping.

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METHOD REV. BY _____ DEPT _____ DATE _____

APPROVED BY	
DEPT _____	DATE _____

Drawing shows waste line IDENTIFICATION

IDAHO NUCLEAR CORPORATION 1600 FALLS ROAD U.S. ATOMIC ENERGY COMMISSION IDAHO OPERATIONS OFFICE IDAHO FALLS, IDAHO	
TSF AREA WASTE LINE IDENTIFICATION	
1230 TRN/TSF 305-1	1230 TRN/TSF 305-1

This drawing shows the horizontal and vertical location of V₁, V₂ and V₃ tanks.

INDEX CODE NUMBER	
034 0416 100 699 106889	

THE RALPH M. PARSONS COMPANY 1111 MARKET STREET SAN FRANCISCO, CALIF. 94102	
U.S. ATOMIC ENERGY COMMISSION IDAHO OPERATIONS OFFICE IDAHO FALLS, IDAHO	
902-3-ANP-616-A 297	

This drawing shows the horizontal and vertical location of V₁, V₂, V₃ and V₉ tanks and location of valves FROM building to V. Tanks

INDEX	
034 0416 100 699 106892	

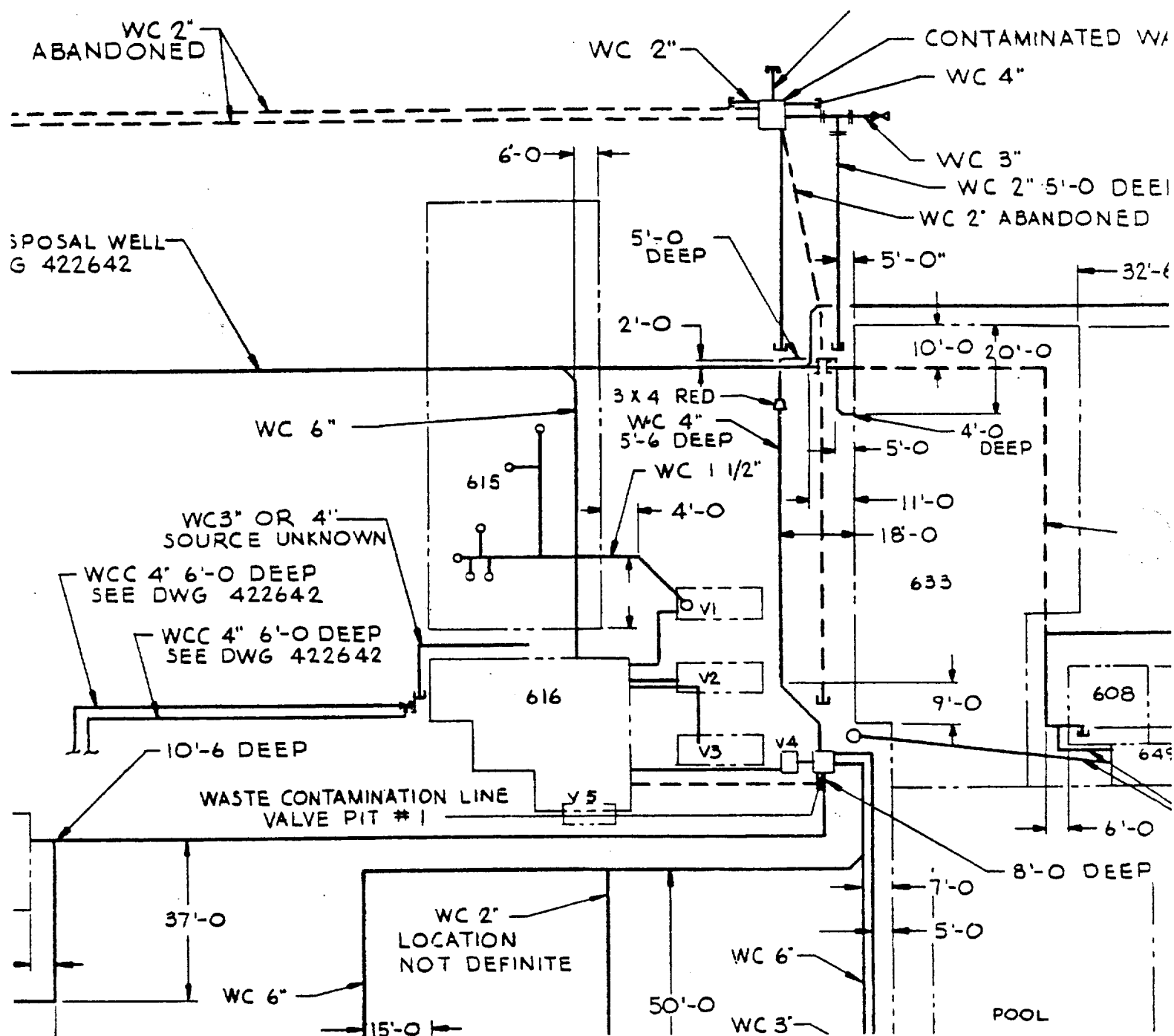
THE RALPH M. PARSONS COMPANY 1111 MARKET STREET SAN FRANCISCO, CALIF. 94102	
U.S. ATOMIC ENERGY COMMISSION IDAHO OPERATIONS OFFICE IDAHO FALLS, IDAHO	
902-3-ANP-616-P 300	

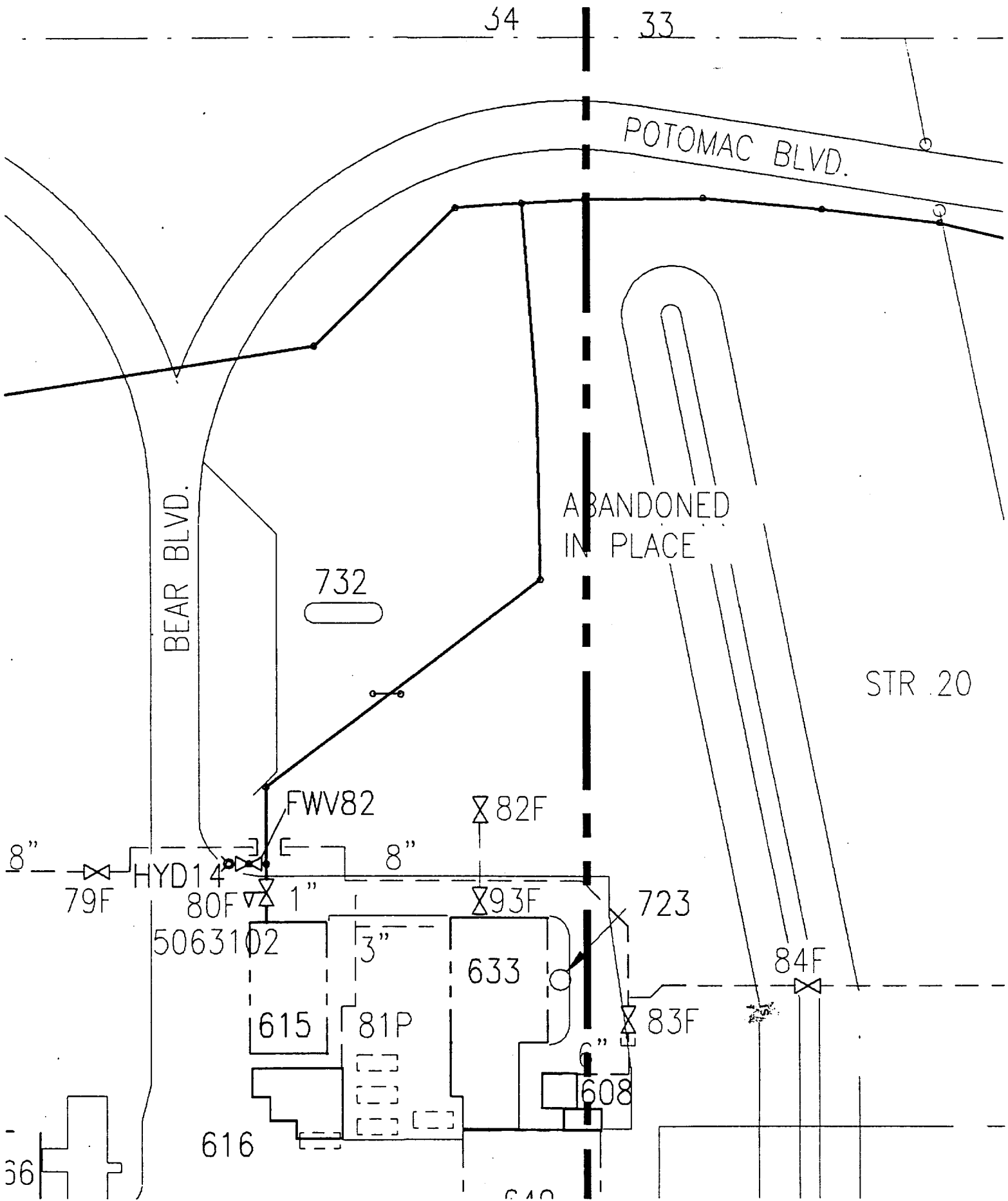
Plan View and cross section of V₉.

This drawing includes the dimension, material, opening locations for V₁, V₂, V₃ and V₉

INDEX CODE NUMBER	
034 0416 100 699 106894	

THE RALPH M. PARSONS COMPANY 1111 MARKET STREET SAN FRANCISCO, CALIF. 94102	
U.S. ATOMIC ENERGY COMMISSION IDAHO OPERATIONS OFFICE IDAHO FALLS, IDAHO	
902-3-ANP-616-P 302	





----- FIRE WATER LINE ABANDONED IN PLACE.

TSF FIREWATER SYSTEM PLAN

LEGEND

- POST INDICATOR VALVE
- ISOLATION VALVE
- FIRE HYDRANT
- FIRE HYDRANT NUMBER
- REDUCER-CENTRIC OR ECCENTRIC
- CAPPED LINE
- PIPE TURNS UP
- FIRE WATER LINE - ACTIVE
- FIRE WATER LINE - ABANDONED IN PLACE
- FWVXX ISOLATION VALVE NUMBER
- HYDXX HYDRANT NUMBER
- PIVXX POST INDICATOR VALVE NUMBER
- XXF FIRE WATER VALVE NUMBER
- XXP POTABLE WATER VALVE NUMBER
- XXRW RAW WATER VALVE NUMBER
- 5 05 26 03 FIRE ALARM EVENT NUMBER
- MODULE
- DCP (DATA COLLECTION POINT)
- MP NUMBER
- AREA (LINE NUMBER)
- AREAS CONTROLLED BY SMC

NOTES:

- FOR PIPING SYMBOLS AND ABBREVIATIONS SEE DRAWING 422623.
- SOME, BUT NOT ALL, POST INDICATOR VALVES ARE WIRED AND HAVE 7 DIGIT EVENT NUMBERS. SEE LEGEND FOR EVENT NUMBER CODING.
- 1" POTABLE WATER LINE IS ROUTED WITHIN ABANDONED 8" FIRE WATER LINE.

FOR ENLARGED PLAN SEE SHEET 2 OF 6

FOR ENLARGED PLAN SEE SHEET 3 OF 6

FOR ENLARGED PLAN SEE SHEET 4 OF 6

FOR ENLARGED PLAN SEE SHEET 5 OF 6

FOR ENLARGED PLAN SEE SHEET 6 OF 6

TSF FIREWATER SYSTEM PLAN

LOCKHEED MARTIN

TAN/TSF AREA

FIRE WATER & UTILITY WATER SITE PLAN

REVISIONS

REV	DESCRIPTION	DATE
8	MULTIPLE REVISIONS TO FACE OF DRAWING AS BUILT. SEE DAR #14390	6-02-98
9	REVISED TO REFLECT AS-BUILT. SEE DAR #11892	1/23/01

AL. CATES 12/15/88
J.C. PACHBUSH 12/15/88
T.L. TRACE 12/28/88

DATE 12/15/88
TIME 12/15/88
FOR REVIEW/REVISION 12/28/88

PROJECT NO. 015566
SPEC CODE 015566
FOR REVIEW/REVISION 12/28/88

AREA 0332200521530
DATE 12/15/88
TIME 12/15/88
FOR REVIEW/REVISION 12/28/88

SCALE 1"=100'-0"

SHEET 1 OF 6

TSF FIREWATER SYSTEM PLAN

LEGEND

- POST INDICATOR VALVE
- ISOLATION VALVE
- FIRE HYDRANT
- FIRE HYDRANT NUMBER
- REDUCER-CENTRIC OR ECCENTRIC
- CAPPED LINE
- PIPE TURNS UP
- FIRE WATER LINE - ACTIVE
- FIRE WATER LINE - ABANDONED IN PLACE
- FWVXX ISOLATION VALVE NUMBER
- HYDXX HYDRANT NUMBER
- PIVXX POST INDICATOR VALVE NUMBER
- XXF FIRE WATER VALVE NUMBER
- XXP POTABLE WATER VALVE NUMBER
- XXRW RAW WATER VALVE NUMBER
- 5 05 26 03 FIRE ALARM EVENT NUMBER
- MODULE
- DCP (DATA COLLECTION POINT)
- MP NUMBER
- AREA (LINE NUMBER)
- AREAS CONTROLLED BY SMC

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FOR ENLARGED PLAN SEE SHEET 2 OF 6

FOR ENLARGED PLAN SEE SHEET 3 OF 6

FOR ENLARGED PLAN SEE SHEET 4 OF 6

FOR ENLARGED PLAN SEE SHEET 5 OF 6

FOR ENLARGED PLAN SEE SHEET 6 OF 6

TSF FIREWATER SYSTEM PLAN

LOCKHEED MARTIN

TAN/TSF AREA

FIRE WATER & UTILITY WATER SITE PLAN

REVISIONS

REV	DESCRIPTION	DATE
8	MULTIPLE REVISIONS TO FACE OF DRAWING AS BUILT. SEE DAR #14390	6-02-98
9	REVISED TO REFLECT AS-BUILT. SEE DAR #11892	1/23/01

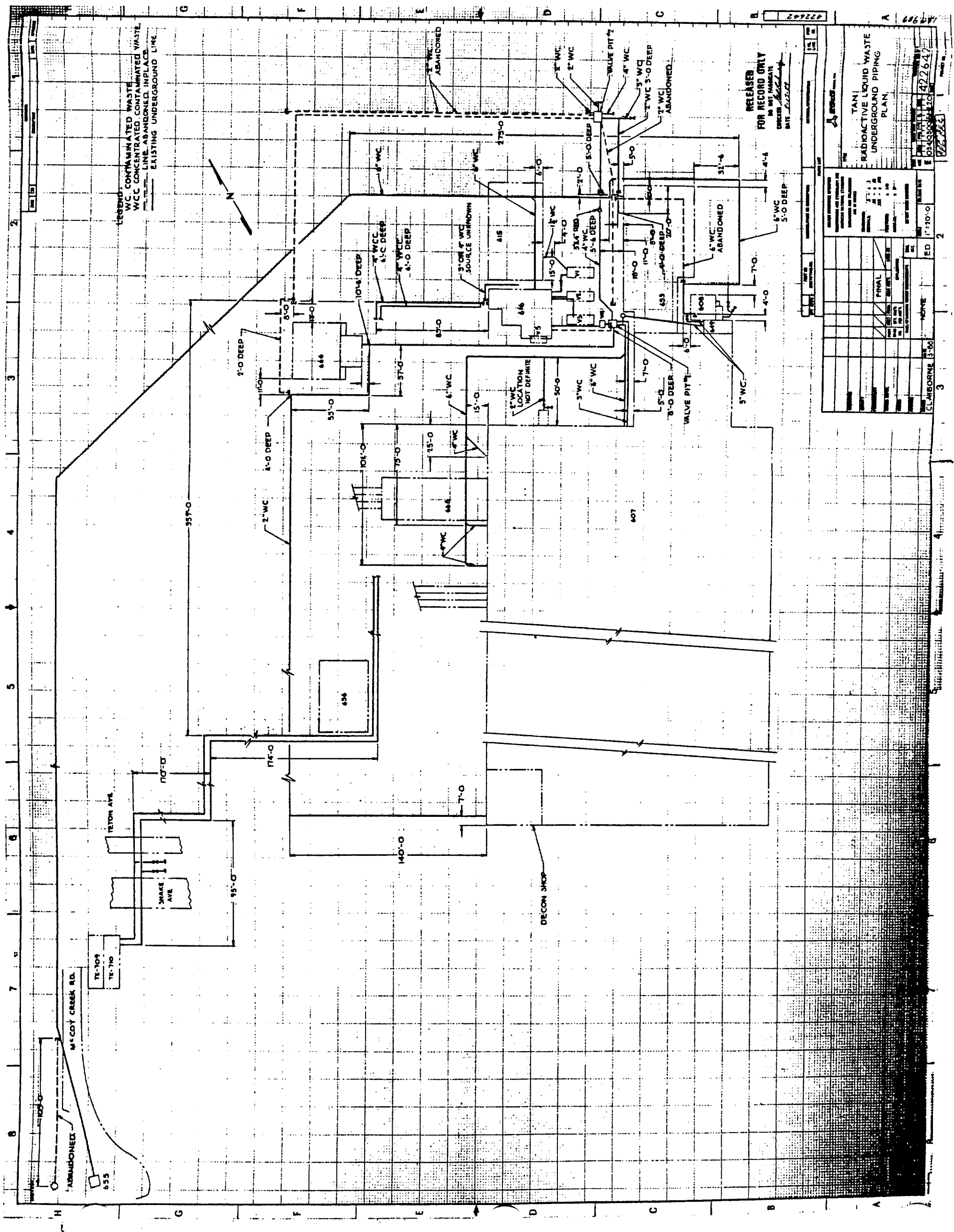
AL. CATES 12/15/88
J.C. PACHBUSH 12/15/88
T.L. TRACE 12/28/88

DATE 12/15/88
DATE 12/15/88
DATE 12/28/88

PROJECT NO. 015566
SPEC CODE 015566
FOR REVIEW/REVISION SIGNATURES

AREA 0332200521530
SCALE 1"=100'-0"

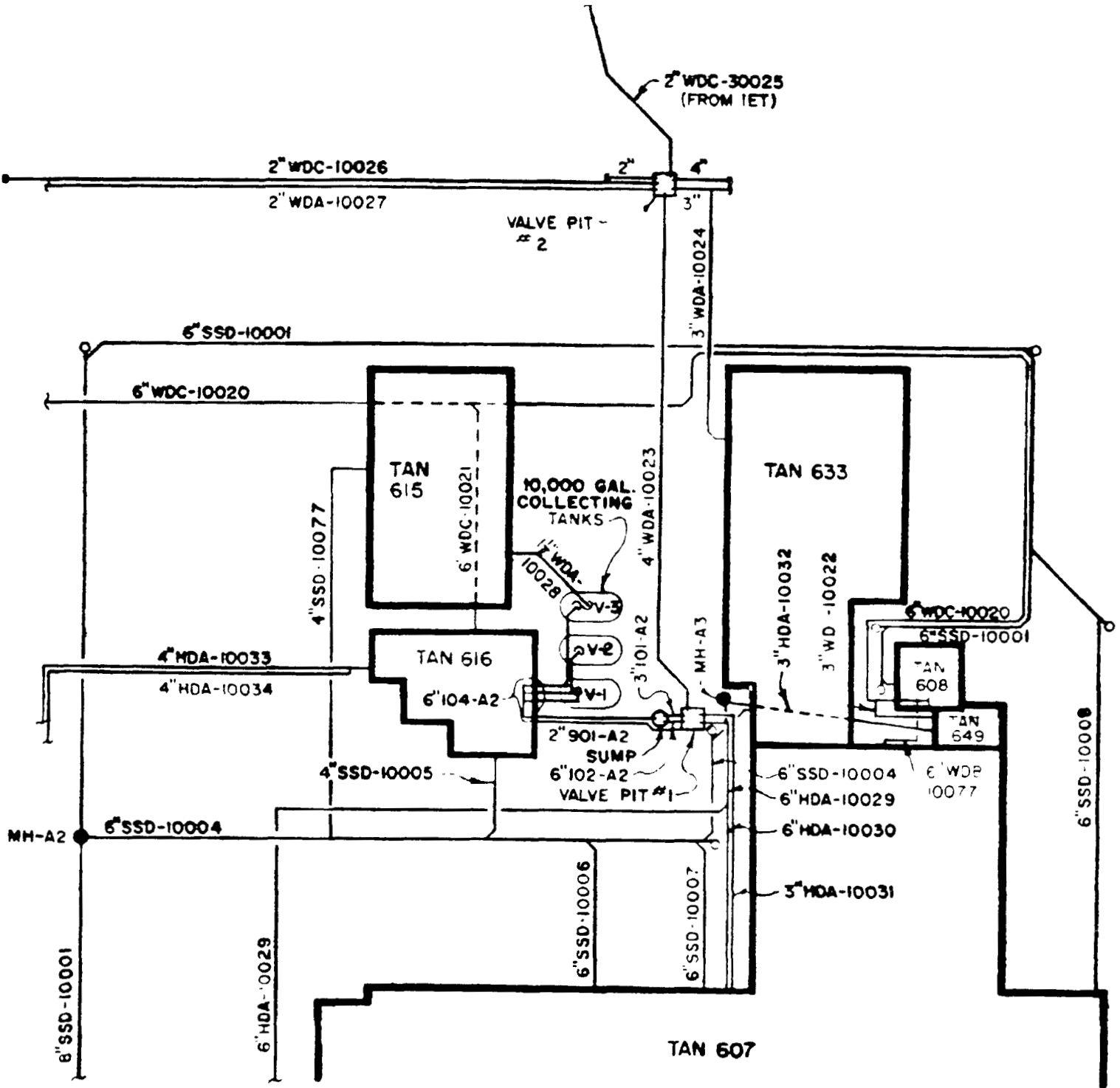
AREA 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100

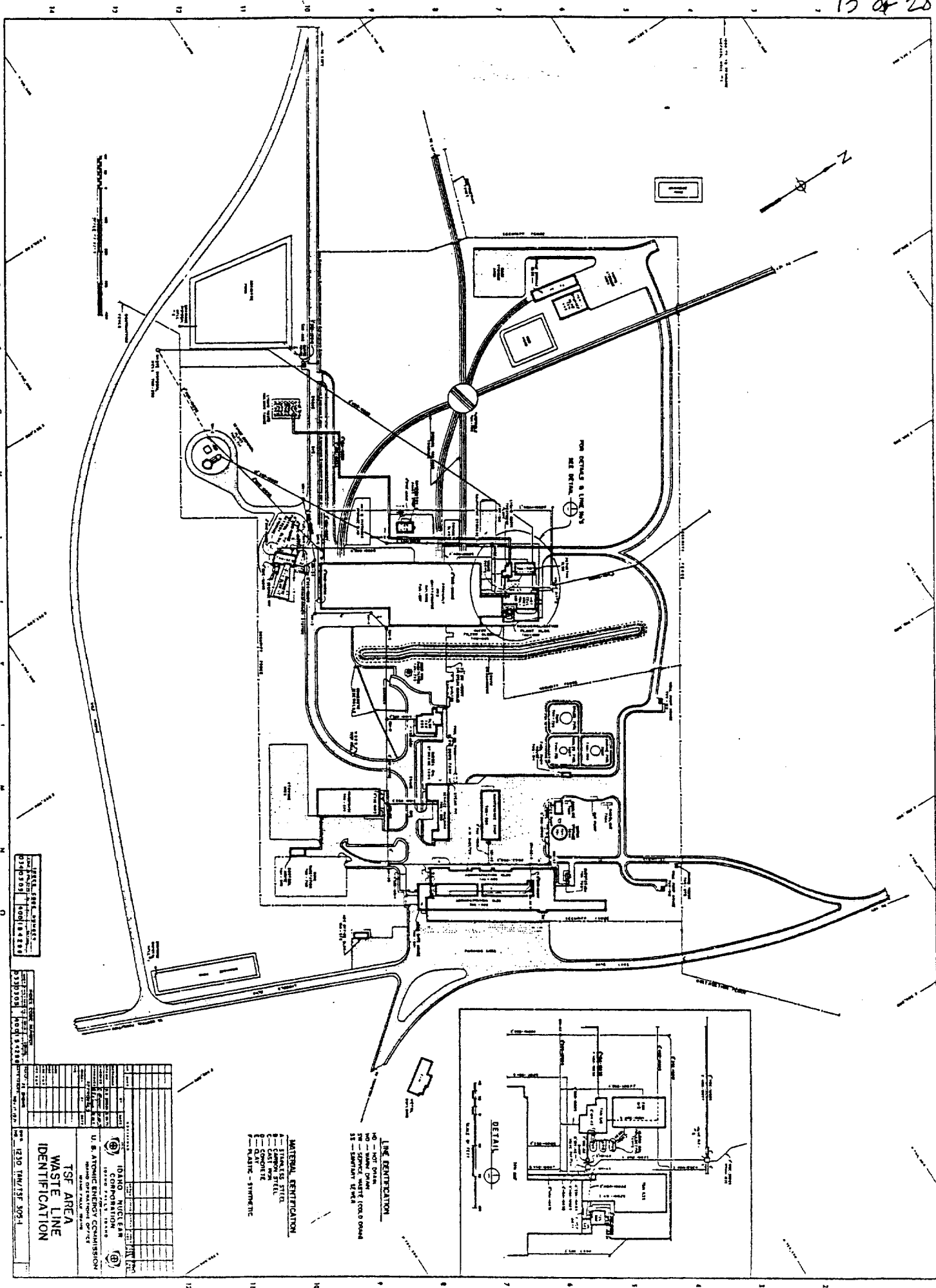


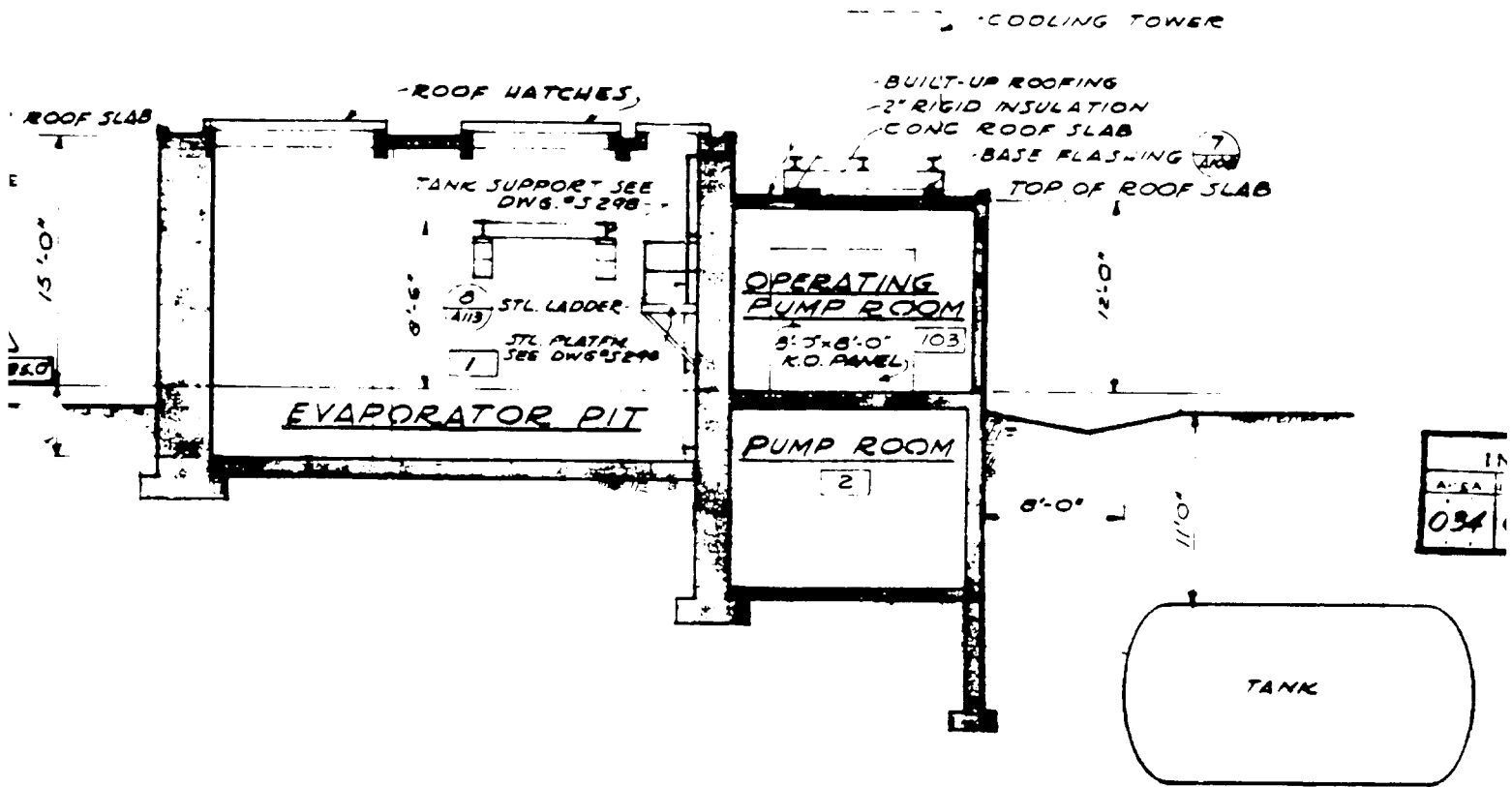
RELEASED
FOR RECORD ONLY
DO NOT MAINTAIN
EXCEED 1000 PSI
DATE 10/1/00

TAN
RADIOACTIVE LIQUID WASTE
UNDERGROUND PIPING
PLAN

REVISIONS		DATE	BY	CHKD	APP'D
1	INITIAL	10/1/00	ED	10/1/00	
2	NOVE	10/1/00			
3	CLABORNE	10/1/00			
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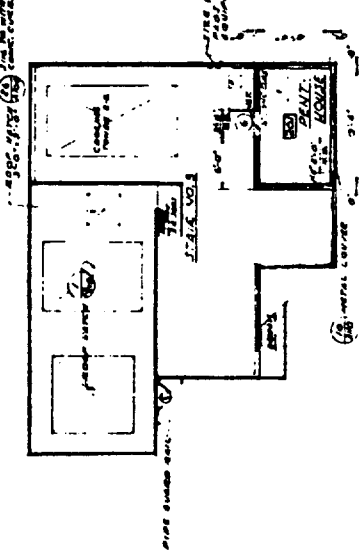


SECTION B
SCALE 1/8" = 1'-0"

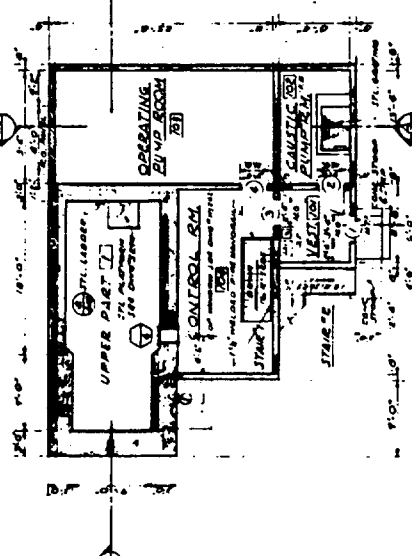
FOR OFFICIAL USE ONLY

ROOM F. V. I. S. I. S. C. H. E. D. U. L. E.				D O O R S C H E D U L E			
ROOM NO.	ROOM NAME OR SPACE NAME	CLG.	REMARKS	DOOR NO.	DOOR TYPE	DOOR WIDTH	DOOR HEIGHT
101	EVAPORATOR PIT	CONCRETE		1	SWING	3'-0"	7'-0"
102	EVAPORATOR PIT	CONCRETE		2	SWING	3'-0"	7'-0"
103	EVAPORATOR PIT	CONCRETE		3	SWING	3'-0"	7'-0"
104	EVAPORATOR PIT	CONCRETE		4	SWING	3'-0"	7'-0"
105	EVAPORATOR PIT	CONCRETE		5	SWING	3'-0"	7'-0"
106	EVAPORATOR PIT	CONCRETE		6	SWING	3'-0"	7'-0"
107	EVAPORATOR PIT	CONCRETE		7	SWING	3'-0"	7'-0"
108	EVAPORATOR PIT	CONCRETE		8	SWING	3'-0"	7'-0"
109	EVAPORATOR PIT	CONCRETE		9	SWING	3'-0"	7'-0"
110	EVAPORATOR PIT	CONCRETE		10	SWING	3'-0"	7'-0"
111	EVAPORATOR PIT	CONCRETE		11	SWING	3'-0"	7'-0"
112	EVAPORATOR PIT	CONCRETE		12	SWING	3'-0"	7'-0"
113	EVAPORATOR PIT	CONCRETE		13	SWING	3'-0"	7'-0"
114	EVAPORATOR PIT	CONCRETE		14	SWING	3'-0"	7'-0"
115	EVAPORATOR PIT	CONCRETE		15	SWING	3'-0"	7'-0"
116	EVAPORATOR PIT	CONCRETE		16	SWING	3'-0"	7'-0"
117	EVAPORATOR PIT	CONCRETE		17	SWING	3'-0"	7'-0"
118	EVAPORATOR PIT	CONCRETE		18	SWING	3'-0"	7'-0"
119	EVAPORATOR PIT	CONCRETE		19	SWING	3'-0"	7'-0"
120	EVAPORATOR PIT	CONCRETE		20	SWING	3'-0"	7'-0"

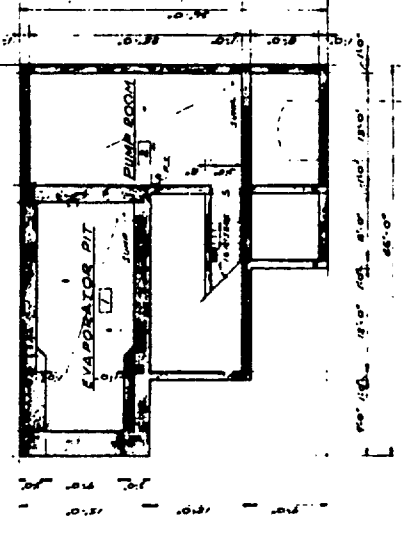
LEGEND
1. 1/2" COAT INTERIOR PLAT. OIL PAINT
2. 1/2" COAT INTERIOR PLAT. OIL PAINT
3. 1/2" COAT INTERIOR PLAT. OIL PAINT
4. 1/2" COAT INTERIOR PLAT. OIL PAINT
5. 1/2" COAT INTERIOR PLAT. OIL PAINT
6. 1/2" COAT INTERIOR PLAT. OIL PAINT
7. 1/2" COAT INTERIOR PLAT. OIL PAINT
8. 1/2" COAT INTERIOR PLAT. OIL PAINT
9. 1/2" COAT INTERIOR PLAT. OIL PAINT
10. 1/2" COAT INTERIOR PLAT. OIL PAINT
11. 1/2" COAT INTERIOR PLAT. OIL PAINT
12. 1/2" COAT INTERIOR PLAT. OIL PAINT
13. 1/2" COAT INTERIOR PLAT. OIL PAINT
14. 1/2" COAT INTERIOR PLAT. OIL PAINT
15. 1/2" COAT INTERIOR PLAT. OIL PAINT
16. 1/2" COAT INTERIOR PLAT. OIL PAINT
17. 1/2" COAT INTERIOR PLAT. OIL PAINT
18. 1/2" COAT INTERIOR PLAT. OIL PAINT
19. 1/2" COAT INTERIOR PLAT. OIL PAINT
20. 1/2" COAT INTERIOR PLAT. OIL PAINT



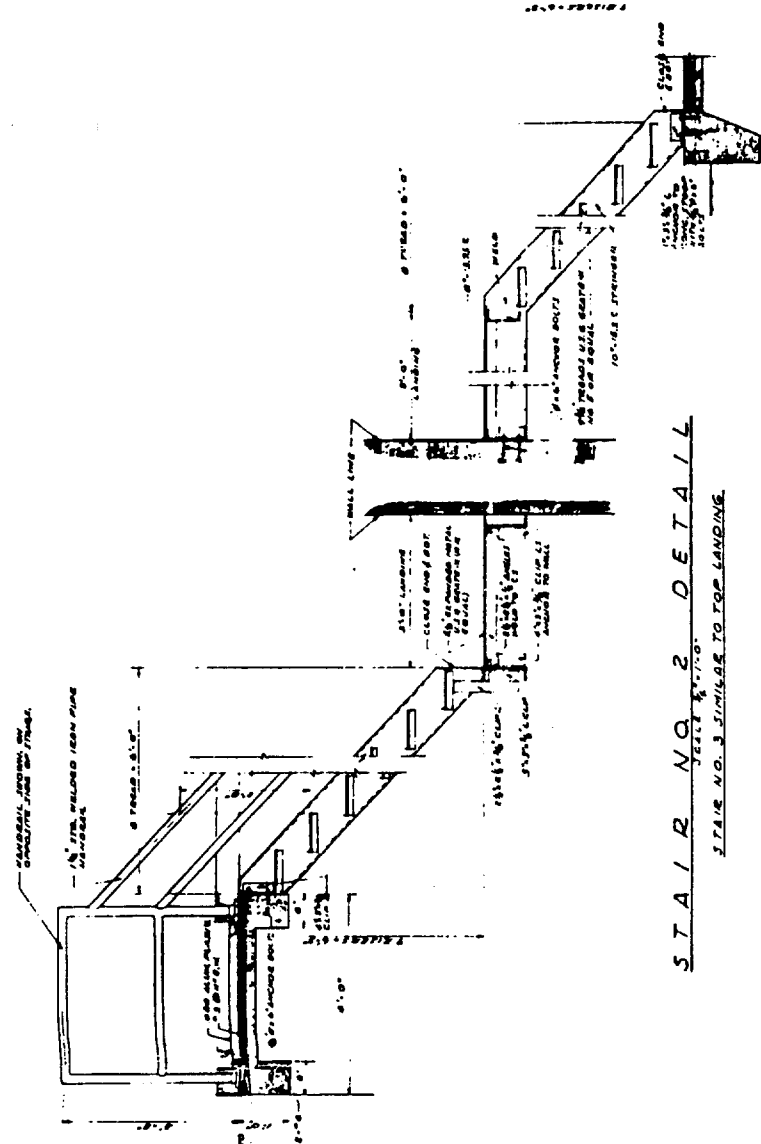
ROOF PLAN
SCALE 1/8" = 1'-0"



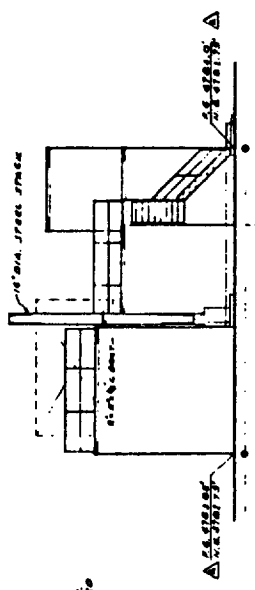
FLOOR PLAN
SCALE 1/8" = 1'-0"



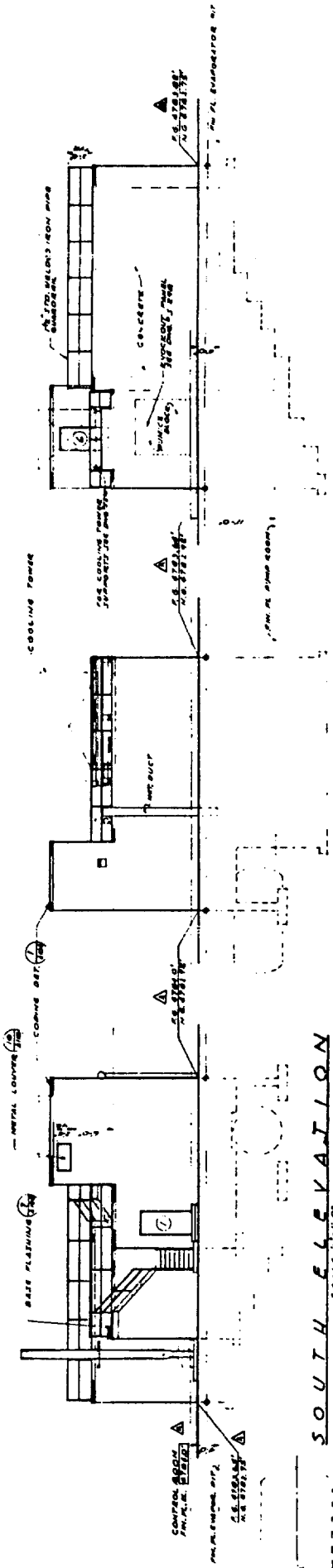
BASEMENT PLAN
SCALE 1/8" = 1'-0"



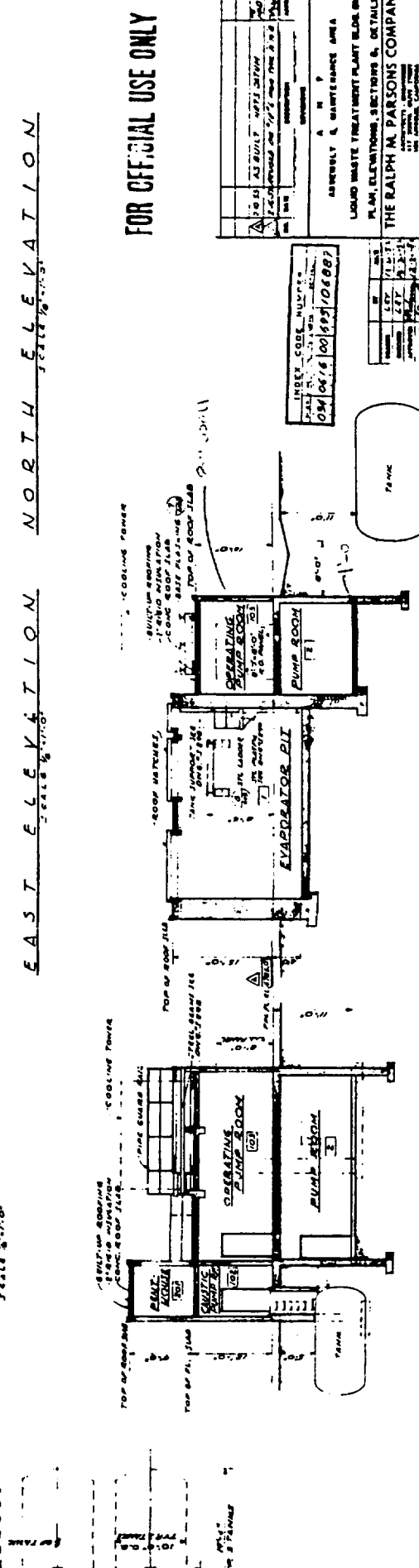
STAIR NO. 2 DETAIL
SCALE 1/4" = 1'-0"
STAIR NO. 3 SIMILAR TO TOP LANDING



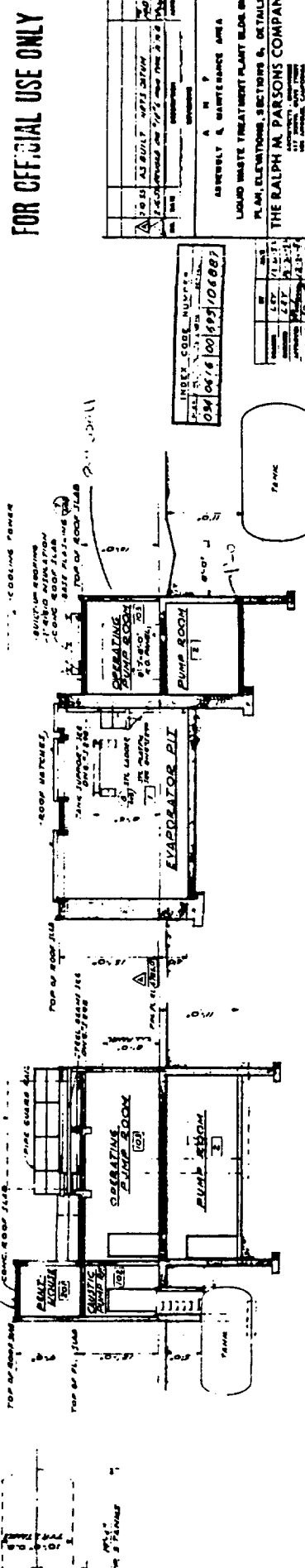
WEST ELEVATION
SCALE 1/8" = 1'-0"



SOUTH ELEVATION
SCALE 1/8" = 1'-0"



EAST ELEVATION
SCALE 1/8" = 1'-0"

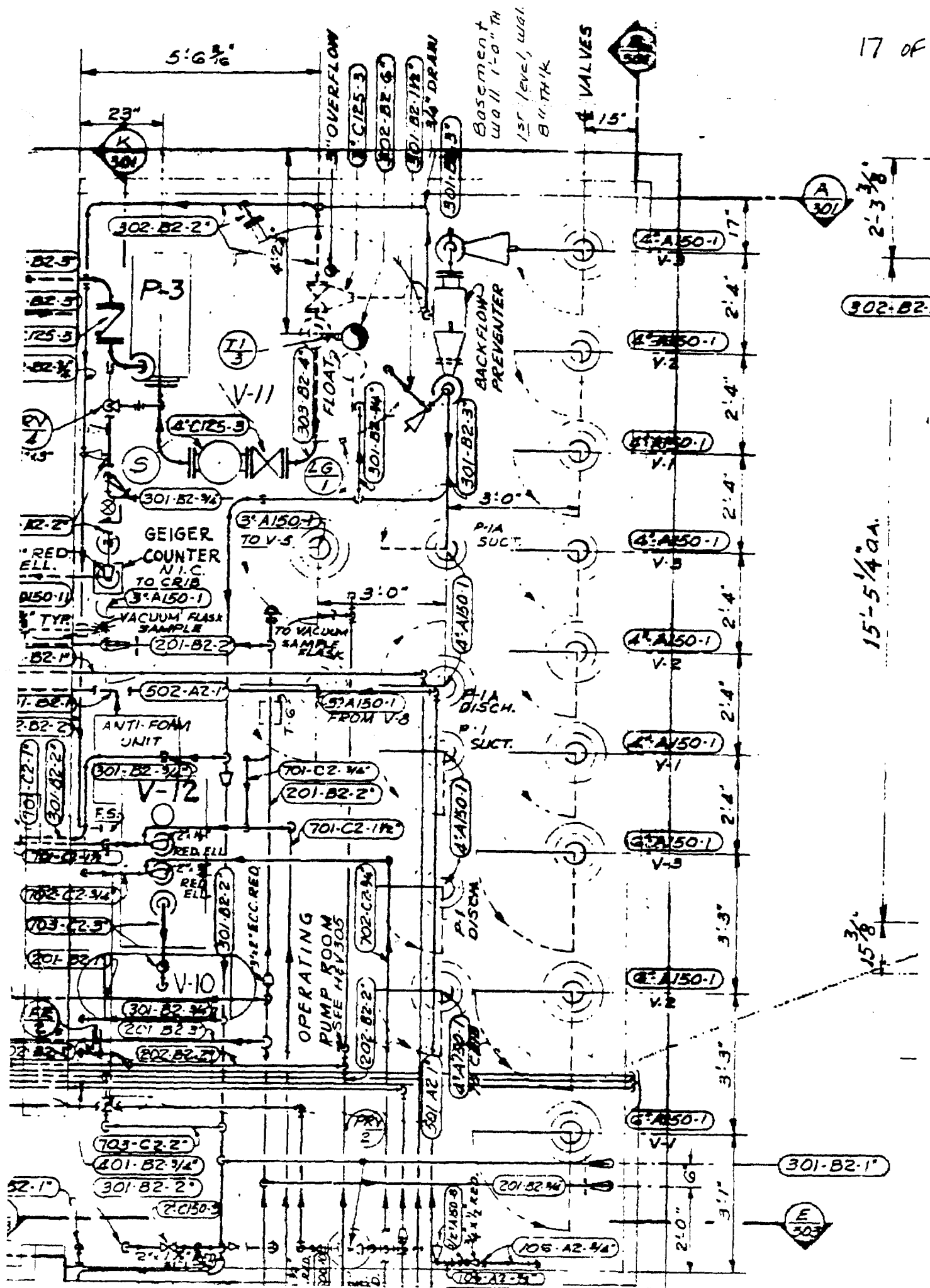


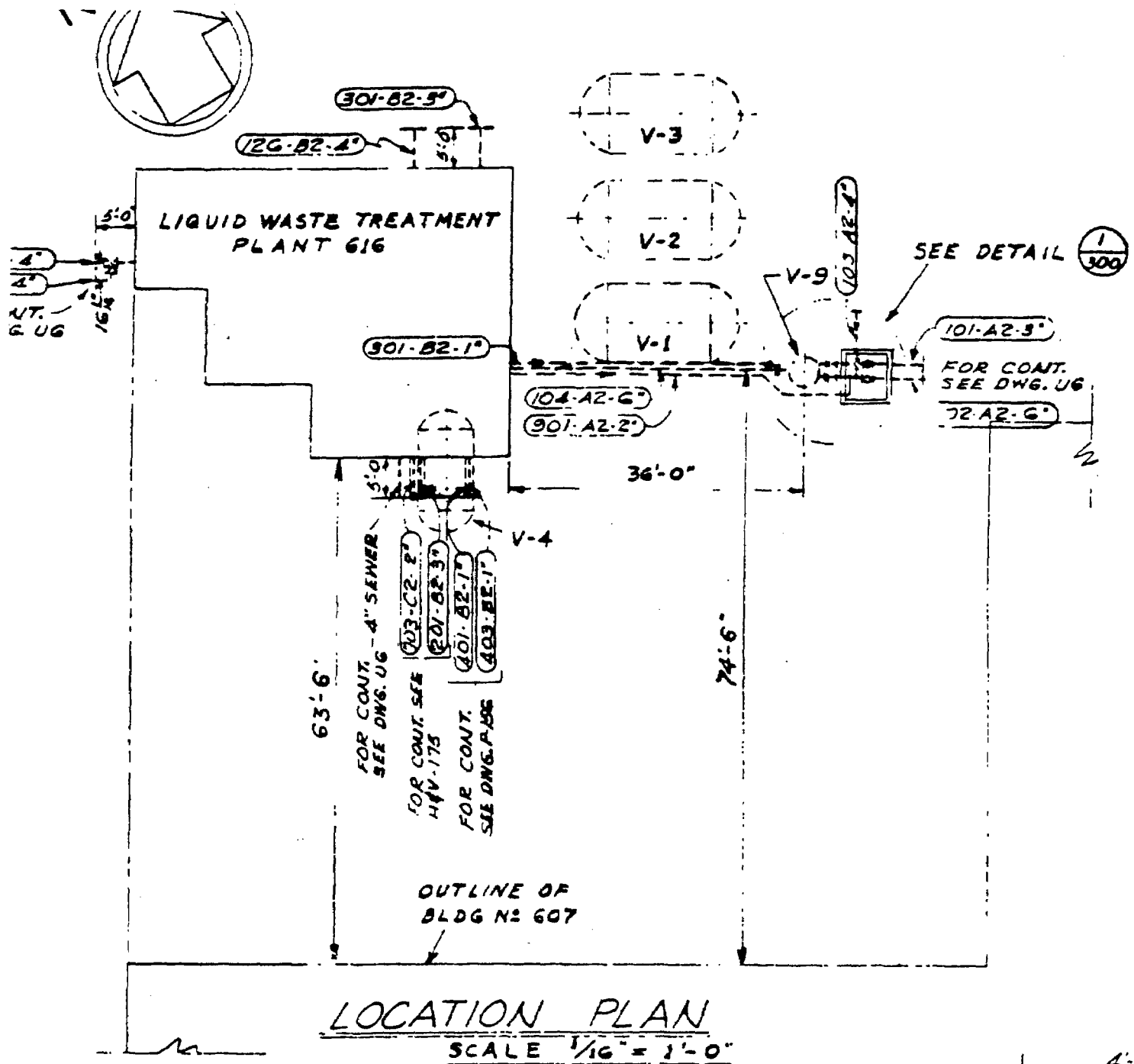
SECTION
SCALE 1/8" = 1'-0"

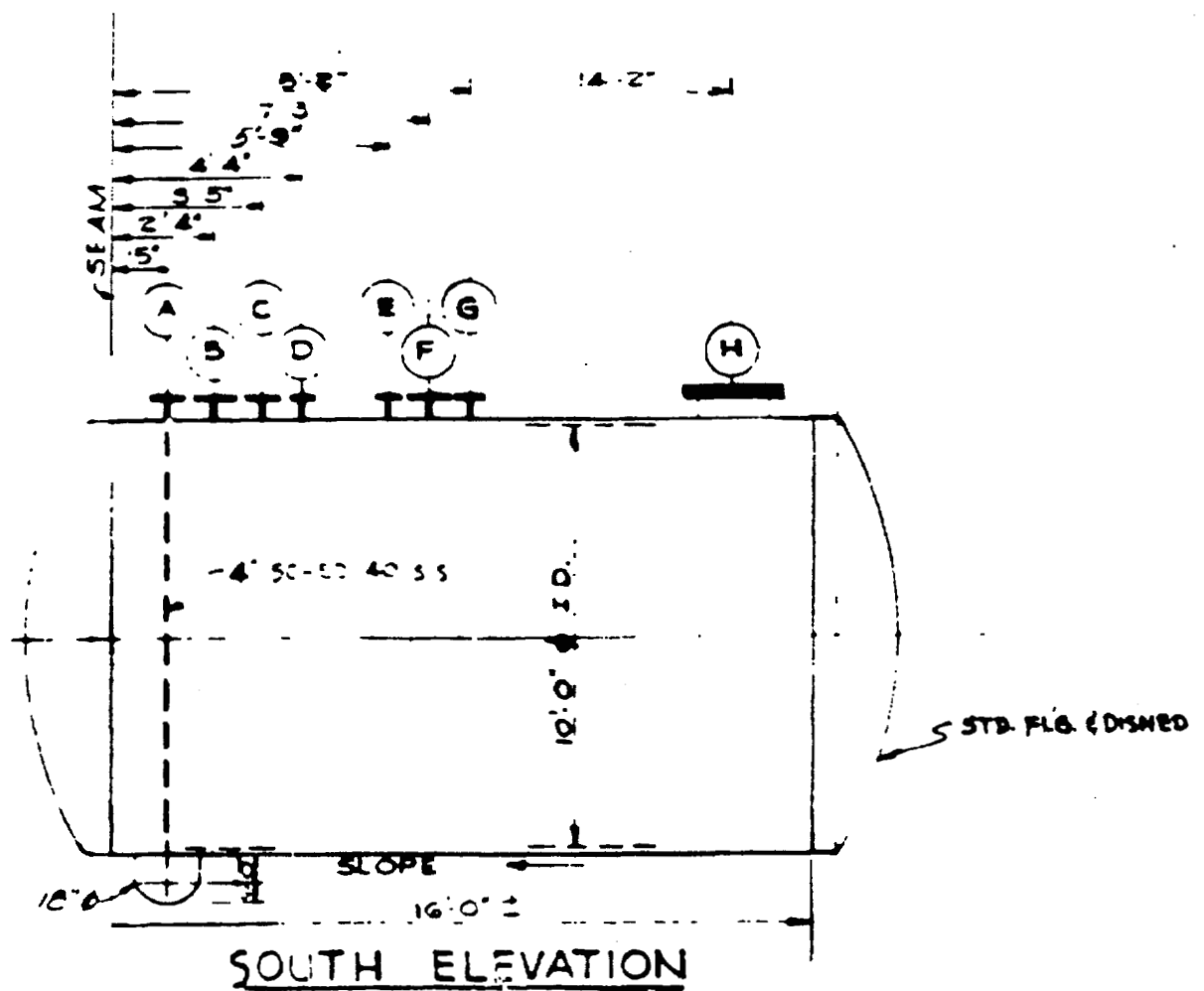
FOR OFFICIAL USE ONLY

FOR OFFICIAL USE ONLY

PROJECT NO.	902-3-AMP-616-A-297
DATE	1/17/52
BY	W. J. B. / J. B. B.
CHECKED BY	J. B. B.
DESIGNED BY	J. B. B.
ENGINEER	J. B. B.
ARCHITECT	J. B. B.
CLIENT	U.S. ATOMIC ENERGY COMMISSION
PROJECT NAME	LIQUID WASTE TREATMENT PLANT BUILDING
LOCATION	PLANT, ELEVATIONS, SECTIONS & DETAILS
DESIGNED BY	THE RALPH M. PARSONS COMPANY
ENGINEER	THE RALPH M. PARSONS COMPANY
ARCHITECT	THE RALPH M. PARSONS COMPANY
CLIENT	U.S. ATOMIC ENERGY COMMISSION





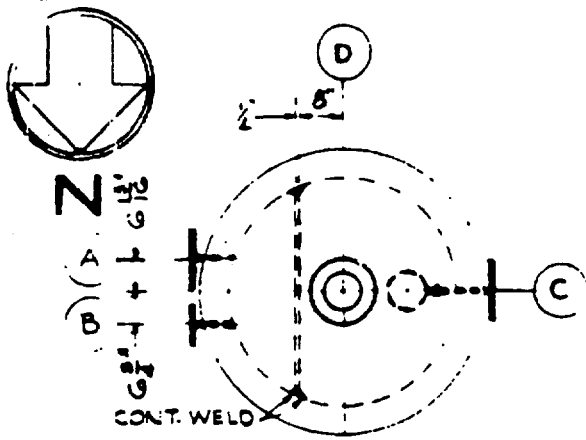
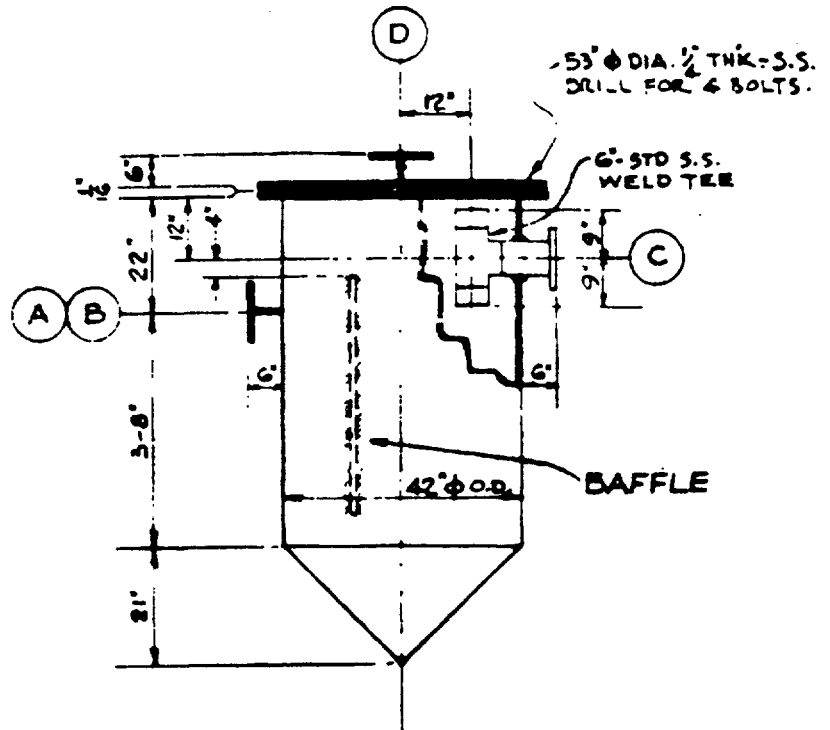


ITEM	SIZE	PRESS	SERVICE	MAT'L.
A	4"	50"	PUMP SUCTION	S.S.
B	6"	50"	LOADING	S.S.
C	4"	50"	PUMP RETURN	S.S.
D	2"	50"	CAUSTIC INLET	S.S.
E	2"	50"	HEA. LIA. LL. CONN.	S.S.
F	6"	50"	SPARE	S.S.
G	3"	50"	VENT	S.S.
H	20"	STD.	MANHOLE W/STD FLG.	S.S.

NOTE:
PROJECTION OF ALL FLG. NOZZLES
SHALL BE 6" UNLESS OTHERWISE
SHOWN.

VESSEL SHALL BE FABRICATED
FOR 10,000 GAL. CAPACITY.

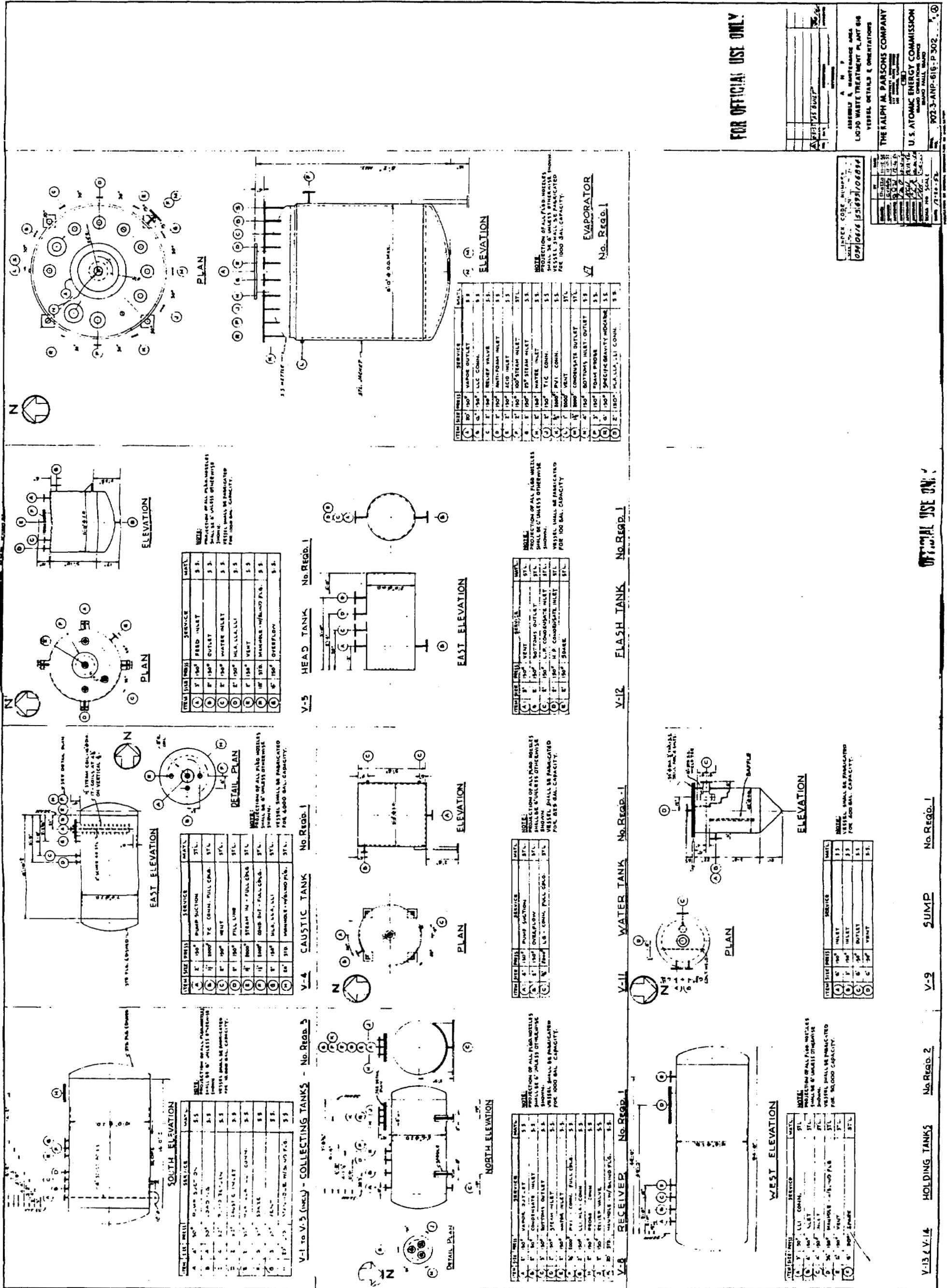
V-1 TO V-3 (INCL) - COLLECTING TANKS - No. REQD. 3

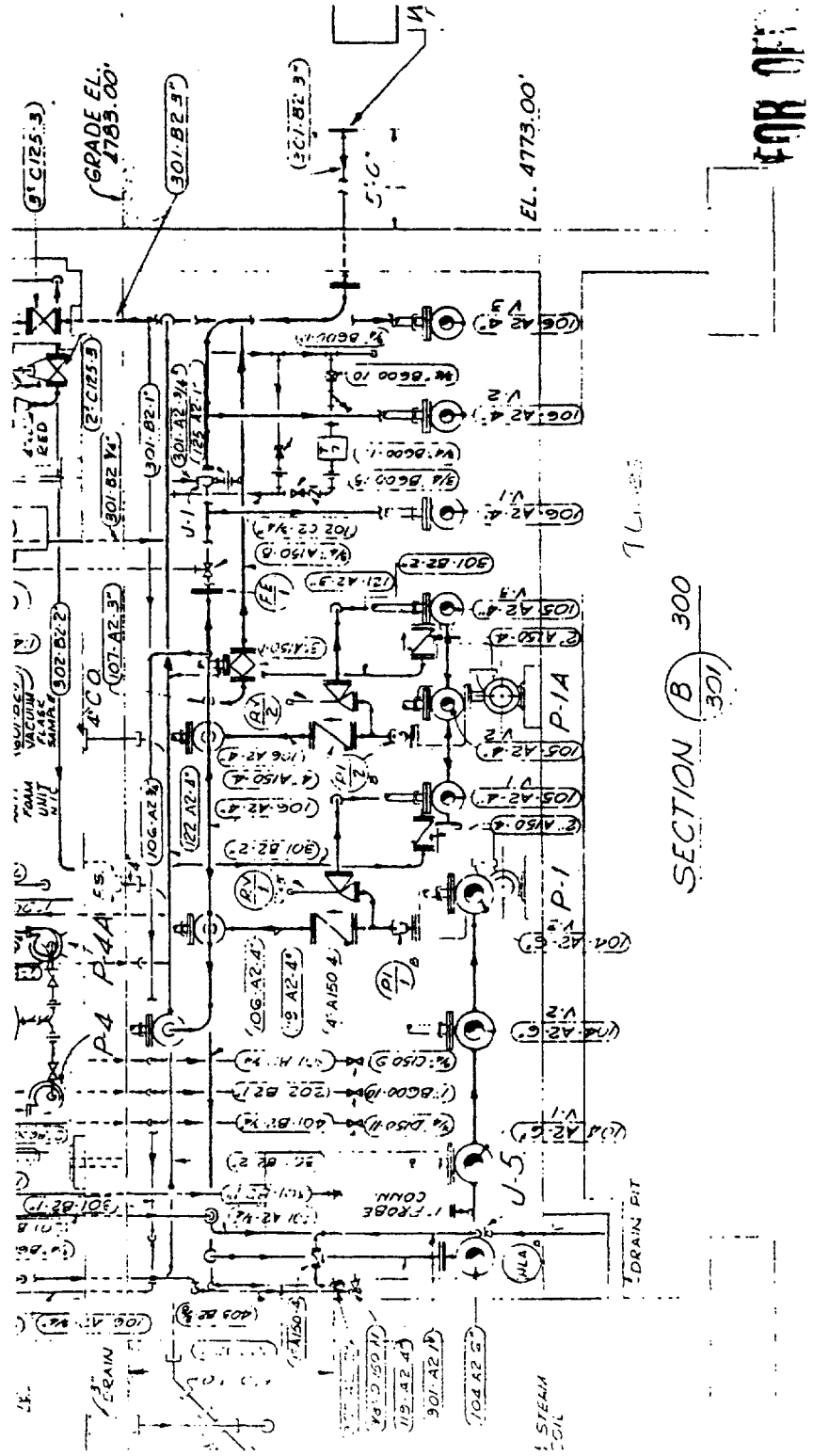
PLANELEVATION

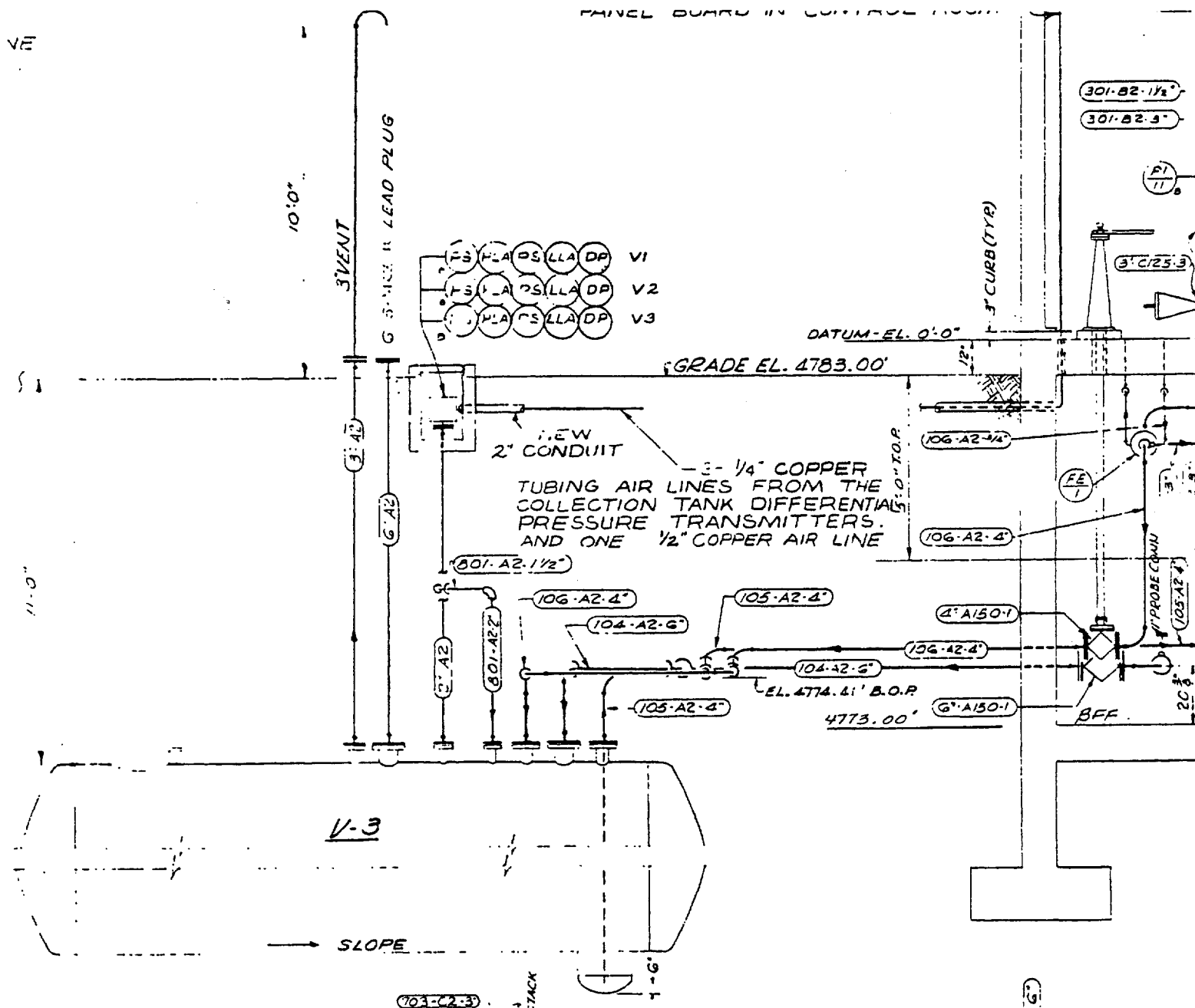
ITEM	SIZE	PRESS	SERVICE	MATL.
(A)	6"	150 ^{psi}	INLET	S.S.
(B)	3"	150 ^{psi}	INLET	S.S.
(C)	6"	150 ^{psi}	OUTLET	S.S.
(D)	6"	150 ^{psi}	VENT	S.S.

NOTE:
VESSEL SHALL BE FABRICATED
FOR 400 GAL. CAPACITY.

V-9SUMPNo. REQD. 1







FOR OFFICIAL USE ONLY

TAILOR DIFFERENTIAL PRESSURE TRANSMITTER

- 1/2" ALUM. PIPE BY 1/2" FLARE ADAPTOR
- 1/2" FLARE NUT
- 1/2" GATE VALVE
- 1/2" LEVEL ALARM
- 1/2" SPECIFIC GRAVITY ALARM
- 1/2" PRESSURE SWITCH
- 3/8" STAINLESS STEEL TUBING



1/2" PRESSURE TRANSMITTER

1/2" N. N. F.

3/4" COPPER LINES TO INSTRUMENT PANEL BOARD IN CONTROL ROOM

HEATING & VENTILATING EQUIPMENT PENHOUSE

EXISTING STRAIN LINE

NEW 3/4" COPPER LINES FROM THE COLLECTION TANK DIFFERENTIAL PRESSURE TRANSMITTERS

SECTION A 300

SECTION B 300

SECTION C 300

SECTION D 300

SECTION E 300

SECTION F 300

SECTION G 300

SECTION H 300

SECTION I 300

SECTION J 300

SECTION K 300

SECTION L 300

SECTION M 300

SECTION N 300

SECTION O 300

SECTION P 300

SECTION Q 300

SECTION R 300

SECTION S 300

SECTION T 300

SECTION U 300

SECTION V 300

SECTION W 300

SECTION X 300

SECTION Y 300

SECTION Z 300

SECTION AA 300

SECTION AB 300

SECTION AC 300

SECTION AD 300

SECTION AE 300

SECTION AF 300

SECTION AG 300

SECTION AH 300

SECTION AI 300

SECTION AJ 300

SECTION AK 300

SECTION AL 300

SECTION AM 300

SECTION AN 300

SECTION AO 300

SECTION AP 300

SECTION AQ 300

SECTION AR 300

SECTION AS 300

SECTION AT 300

SECTION AU 300

SECTION AV 300

SECTION AW 300

SECTION AX 300

SECTION AY 300

SECTION AZ 300

SECTION BA 300

SECTION BB 300

SECTION BC 300

SECTION BD 300

SECTION BE 300

SECTION BF 300

SECTION BG 300

SECTION BH 300

SECTION BI 300

SECTION BJ 300

SECTION BK 300

SECTION BL 300

SECTION BM 300

SECTION BN 300

SECTION BO 300

SECTION BP 300

SECTION BQ 300

SECTION BR 300

SECTION BS 300

SECTION BT 300

SECTION BU 300

SECTION BV 300

SECTION BW 300

SECTION BX 300

SECTION BY 300

SECTION BZ 300

SECTION CA 300

SECTION CB 300

SECTION CC 300

SECTION CD 300

SECTION CE 300

SECTION CF 300

SECTION CG 300

SECTION CH 300

SECTION CI 300

SECTION CJ 300

SECTION CK 300

SECTION CL 300

SECTION CM 300

SECTION CN 300

SECTION CO 300

SECTION CP 300

SECTION CQ 300

SECTION CR 300

SECTION CS 300

SECTION CT 300

SECTION CU 300

SECTION CV 300

SECTION CW 300

SECTION CX 300

SECTION CY 300

SECTION CZ 300

SECTION DA 300

SECTION DB 300

SECTION DC 300

SECTION DD 300

SECTION DE 300

SECTION DF 300

SECTION DG 300

SECTION DH 300

SECTION DI 300

SECTION DJ 300

SECTION DK 300

SECTION DL 300

SECTION DM 300

SECTION DN 300

SECTION DO 300

SECTION DP 300

SECTION DQ 300

SECTION DR 300

SECTION DS 300

SECTION DT 300

SECTION DU 300

SECTION DV 300

SECTION DW 300

SECTION DX 300

SECTION DY 300

SECTION DZ 300

SECTION EA 300

SECTION EB 300

SECTION EC 300

SECTION ED 300

SECTION EE 300

SECTION EF 300

SECTION EG 300

SECTION EH 300

SECTION EI 300

SECTION EJ 300

SECTION EK 300

SECTION EL 300

SECTION EM 300

SECTION EN 300

SECTION EO 300

SECTION EP 300

SECTION EQ 300

SECTION ER 300

SECTION ES 300

SECTION ET 300

SECTION EU 300

SECTION EV 300

SECTION EW 300

SECTION EX 300

SECTION EY 300

SECTION EZ 300

SECTION FA 300

SECTION FB 300

SECTION FC 300

SECTION FD 300

SECTION FE 300

SECTION FF 300

SECTION FG 300

SECTION FH 300

SECTION FI 300

SECTION FJ 300

SECTION FK 300

SECTION FL 300

SECTION FM 300

SECTION FN 300

SECTION FO 300

SECTION FP 300

SECTION FQ 300

SECTION FR 300

SECTION FS 300

SECTION FT 300

SECTION FU 300

SECTION FV 300

SECTION FW 300

SECTION FX 300

SECTION FY 300

SECTION FZ 300

SECTION GA 300

SECTION GB 300

SECTION GC 300

SECTION GD 300

SECTION GE 300

SECTION GF 300

SECTION GG 300

SECTION GH 300

SECTION GI 300

SECTION GJ 300

SECTION GK 300

SECTION GL 300

SECTION GM 300

SECTION GN 300

SECTION GO 300

SECTION GP 300

SECTION GQ 300

SECTION GR 300

SECTION GS 300

SECTION GT 300

SECTION GU 300

SECTION GV 300

SECTION GW 300

SECTION GX 300

SECTION GY 300

SECTION GZ 300

SECTION HA 300

SECTION HB 300

SECTION HC 300

SECTION HD 300

SECTION HE 300

SECTION HF 300

SECTION HG 300

SECTION HH 300

SECTION HI 300

SECTION HJ 300

SECTION HK 300

SECTION HL 300

SECTION HM 300

SECTION HN 300

SECTION HO 300

SECTION HP 300

SECTION HQ 300

SECTION HR 300

SECTION HS 300

SECTION HT 300

SECTION HU 300

SECTION HV 300

SECTION HW 300

SECTION HX 300

SECTION HY 300

SECTION HZ 300

SECTION IA 300

SECTION IB 300

SECTION IC 300

SECTION ID 300

SECTION IE 300

SECTION IF 300

SECTION IG 300

SECTION IH 300

SECTION II 300

SECTION IJ 300

SECTION IK 300

SECTION IL 300

SECTION IM 300

SECTION IN 300

SECTION IO 300

SECTION IP 300

SECTION IQ 300

SECTION IR 300

SECTION IS 300

SECTION IT 300

SECTION IU 300

SECTION IV 300

SECTION IW 300

SECTION IX 300

SECTION IY 300

SECTION IZ 300

SECTION JA 300

SECTION JB 300

SECTION JC 300

SECTION JD 300

SECTION JE 300

SECTION JF 300

SECTION JG 300

SECTION JH 300

SECTION JI 300

SECTION JJ 300

SECTION JK 300

SECTION JL 300

SECTION JM 300

SECTION JN 300

SECTION JO 300

SECTION JP 300

SECTION JQ 300

SECTION JR 300

SECTION JS 300

SECTION JT 300

SECTION JU 300

SECTION JV 300

SECTION JW 300

SECTION JX 300

SECTION JY 300

SECTION JZ 300

SECTION KA 300

SECTION KB

2" WDC-30025
(FROM IET)

2" WDC-10026 (EXIST.)

2" WDA-10027 (EXIST.)

2"φ

4"φ

3"φ

VALVE PIT #2

8" CAST IRON PIPE

ABANDONED IN PLACE

6" SSD-10001

2 1/2"φ

6" WDC

ABANDONED

EXISTING
ACTUATOR
BUILDING
TAN 615

EXISTING
TAN 633
HOT CELL AREA

ABANDONED

EXISTING
10000 GAL
COLLECTING
TANKS

ABANDONED
8" WATER
LINES

4" SSD-10077
(EXIST.)

6" WDC-10021
(EXIST.)

4" WDA-10023 (EXIST.)

EXISTING LIQUID
WASTES
TREATMENT
PLANT
TAN 616

V-9
UNDERGROUND
TANK (EXIST.)

VALVE PIT #1 (EXIST.)

STA. 0+00 BEGIN NEW 6" PL-A-3
N 294.50 SEE DWG. 3-C

4" SSD-10005

901-A2-2"

W833.48

6" PL-A-3

STA. 0+15.17

6" HDA-10029

6" HDA-10030

3" HDA-10031

(EXIST.)

1"-LI-N-5

TIE-IN TO
EXISTING 1 1/2"
AIR LINE AT
EL. 4778.50 ±

STEAM AND CONDENSATE
CONDUIT

1 1/2" MA LINE (EXIST.)

1/4" A LINE

EXISTING
6" A-10029
"DW-
(EXIST.)

W921.65

6" SSD-10004
(EXIST.)

6" SSD-10006
(EXIST.)

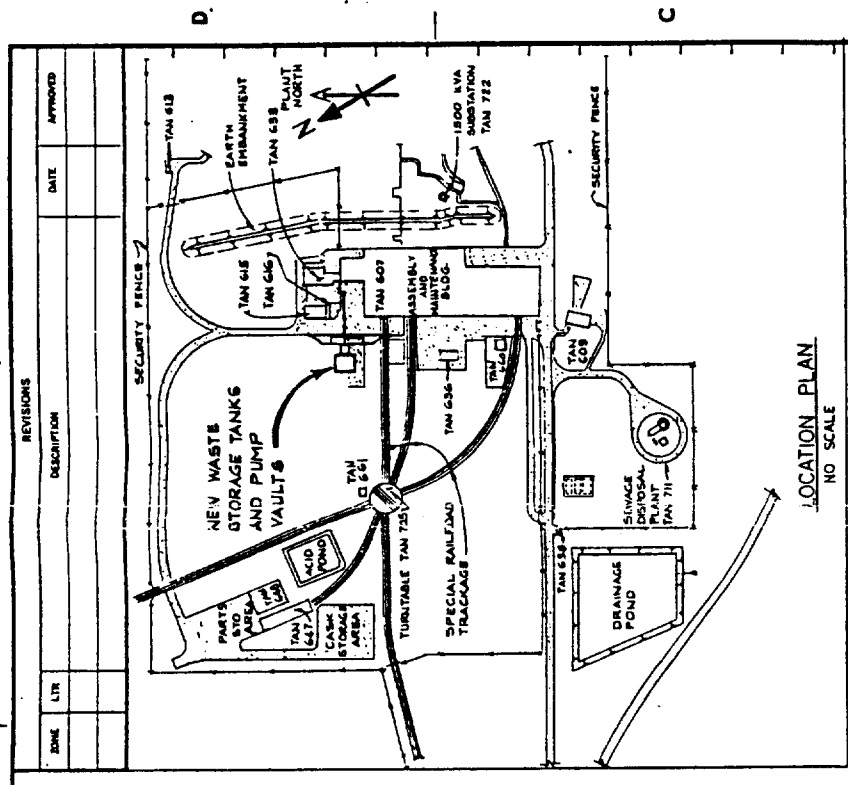
6" FIBRE DUCT
(EXIST.)

6" SSD-10007
(EXIST.)

222.83


TAN 607

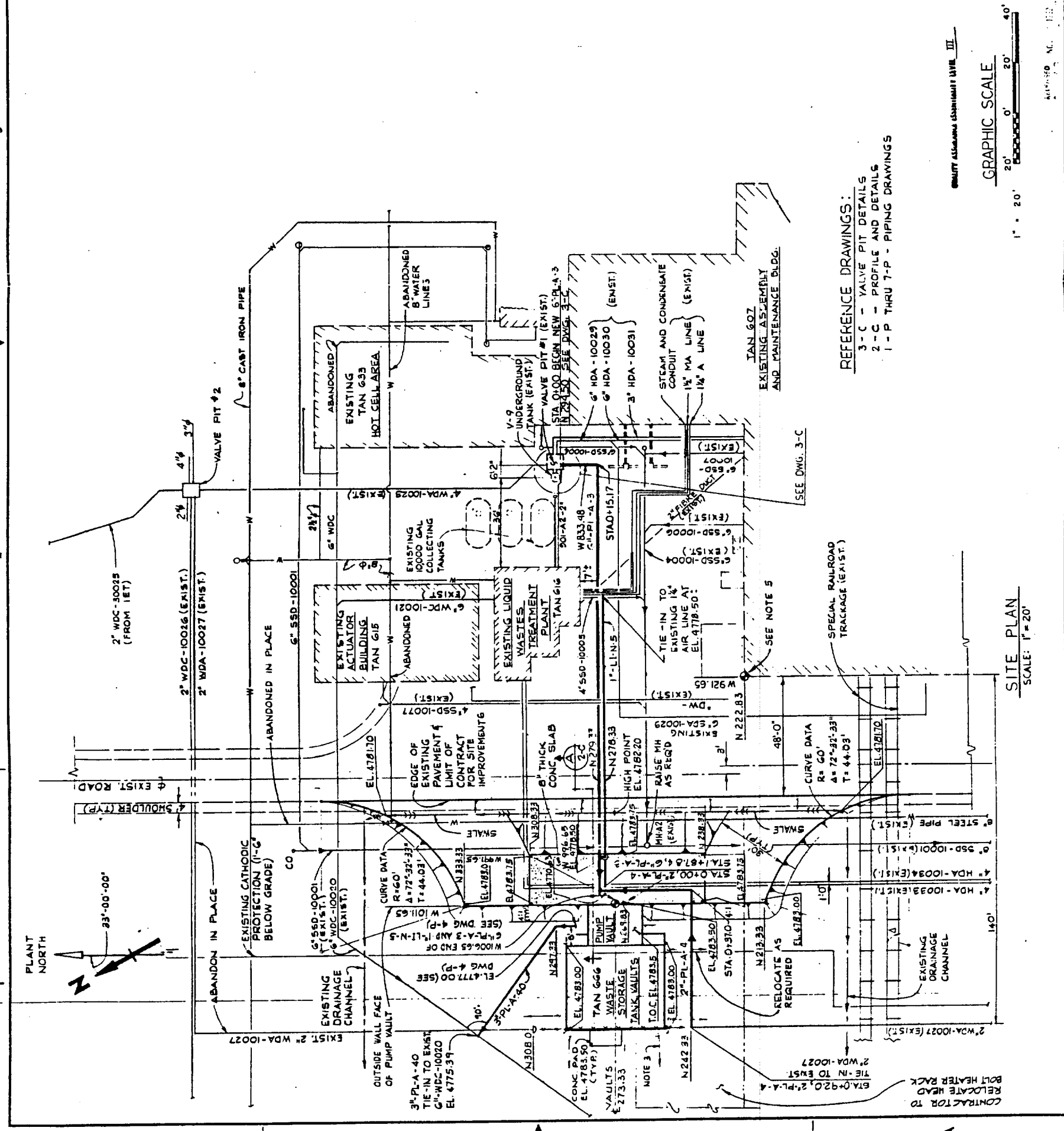
EXISTING ASSEMBLY



NOTES:

1. FOR LEGEND AND ABBREVIATIONS SEE PIPING DWG. 1-P
2. A MINIMUM EARTH COVER OF 6'-0" WILL BE PROVIDED OVER ALL PIPES FOR PROTECTION AGAINST FREEZING WEATHER. OUR TANKS ARE EXISTING
3. SLOPE AREAS ADJACENT TO PUMP AND TANK VAULTS A MINIMUM OF 1.0% AWAY FROM THE STRUCTURES.
4. FIELD VERIFY LOCATIONS AND ELEVATIONS OF EXISTING FACILITIES AND UTILITIES.
5. ALL COORDINATES ARE CALCULATED FROM 0+00 BASE. LOCATED 360' EAST OF TAN 603 ON E SNAKE AVE. COORDINATES ARE APPROXIMATE AND SHALL BE VERIFIED IN THE FIELD BY THE CONTRACTOR.

DRAWN BY: F. BUMATAY		DATE: 6-6-79	 Kaiser ENGINEERS	FOR U.S. DEPARTMENT OF ENERGY IDAHO OPERATIONS OFFICE IDAHO FALLS, IDAHO	TAN RADIOACTIVE LIQUID WASTE STORAGE AND TRANSFER SYSTEM	SITE PLAN (INCLUDING PAVING, GRADING & UTILITIES)	DRAWING NUMBER 138651	I-C	SHEET
DESIGNED BY: W. J. JONES		DATE: 6-7-79							
CHECKED BY: N. PATEL		DATE: 6-11-79							
APPROVED BY: T. CHENG		DATE: 6-7-79							
APPROVED ON: 8-10-79		DATE: 10-15-79							
E.O. 12812 COMPLIANT SAFETY O.P. FALLS TANK FIELDS "H. P. SLACK" PROPOSED R.E. ORSHIN			DATE: 10-15-79						
			DATE: 10-23-79						
			DATE: 10-24-79						
SCALE: 1" = 20'		RELEASE DATE: 11-3-82	INSD CODE NUMBER AREA: 0 3 4 DWG TYPE: 0 0 0 CL: 5 DWG: 1 4 8 6						



REFERENCE DRAWINGS:

III. BIRTH AND DEATHS OF THE ALIENS

GRAPHIC SCALE



RECEIVED

CALCULATION COVER SHEET



Project:	INEEL V-Tank Remediation Project				Number of Sheets: 1 of 27
Site:	INEEL Test Area North, Idaho Falls, Idaho				
Calculation Number:	ABQ12 – CE008		Work Order Number:	12393.002.001	
Subject:	Water Filtration				
Rev #	Date:	Revision:	Calculated by:	Checked by:	Approved:
RAA	4/31/01	90%	Art Desrosiers	Berg Keshian	
RAB	6/14/01	90%	Art Desrosiers	Berg Keshian	Berg Keshian
RAC	9/28/01	Draft Final	George Prior	Berg Keshian	Daniel Brennecke
RAD	10/22/01	Draft Final Polish	George Prior	Berg Keshian	Jim Lockhart

[Signature]
10/24/01

Assumptions:

The loading capacity of granular activated carbon (GAC) was based on published isotherms found in the EPA Tractability Manual, EPA-600/8-80-042a. The quantity of GAC required to remove each compound was calculated and totaled for all compounds to define the total quantity of GAC required. 55-gallon size GAC units will be used with a maximum flow rating of 10 gpm. Two trains with two units in series for each train will be used. Incidental removal of mercury may occur on the GAC, but for purpose of this analysis it was assumed that no mercury removal will occur.

Heavy metals will be removed with ion exchange. The loading will include all cations except sodium and hydrogen. Sufficient resin will be provided to treat the water without regeneration. The resin will then be disposed with the heavy metals and radionuclides attached.

Sources of Data:

ABQ03-HP003-RAC
 ABQ04-HP004-RAC
 GWTF Radionuclide Removal Evaluation (June 17, 1996)
 INEL-95/0421 Rev. 0 October 1995
 RD/RA WP Appendices H & G – Sampling data for the V Tanks
www.generalcarbon.com
www.usfilter.com

Calculation:

Sample calculations are presented herein to show the methodology used and the results of all calculations are summarized on calculation sheets (Attachment 1) and in the mass balance charts included with the process description in Attachment.

Water treatment from Tank V-1

Volume = 644 gal

TCE level = 0.16 mg/L

$$(644)(10^{-6})(0.16)(8.34) = 8.59(10^{-4}) \text{ lb}$$

Isotherm capacity at 0.01 mg/L = 0.002 lb/lb GAC

$$8.59(10^{-4})/0.002 = 0.43 \text{ lb GAC used}$$

Lead = 0.84 mg/l

$$\text{CaCO}_3 \text{ equivalent: } 0.84(100/207) = 0.406 \text{ mg/l as CaCO}_3$$

Radionuclide Conversion

$$\begin{aligned} \text{Mg/L} &= (\text{pCi/L}) \cdot 10^{-12} (\text{Ci/pCi}) \cdot 10^3 (\text{mg/g}) / \text{Specific Activity (Ci/g)} \\ (1.89\text{E} + 04)(10^{-12})(10^3)/6.17\text{E}-03 &= 0.031 \text{ mg/L} \\ \text{Equiv. CaCO}_3 &= 0.0031(100/234) = 0.0013 \text{ mg/L} \\ \text{U-234} &= 1.89\text{E} + 04 \text{ pCi/L} \end{aligned}$$

$$\text{Specific Activity} = 6.17\text{E}-03$$

Composite for drum filling for Lead

$$V-1: (1040 \text{ gal})(0.84 \text{ mg/L}) = 873.6$$

$$V-9: (320) (0.942) = \underline{301.4}$$

$$1174.0$$

$$\text{Total Volume} = 3706$$

$$1174.0/3706 = 0.317 \text{ mg/L}$$

Contingency:

Two trains of GAC units will be operated in parallel to provide added removal of organics in the event that organics in the sludge become soluble during the removal process.

Procedures:

The TOC at the exit of the first bed will be monitored to allow changing beds that are prematurely exhausted. The liquid phase waste will be filtered through oil and grease filters, activated carbon and ion exchanged, then pumped into water HICs. The water will be transferred into a temporary storage tank and sampled for compliance with LDRs. Any additional treatment that is required or desired will be accomplished with a backup treatment system which can be configured with activated carbon and ion exchange, as required.

Conclusion:

This calculation determines the quantity of filtration material required to remove contaminants in the liquid phase of the V-Tanks contents in order to satisfy the land disposal regulations (LDRs) according to the wastewater treatment standard. Since Envirocare cannot accept liquid radioactive waste, the water must be solidified or absorbed prior to shipping for disposal. For conservatism, however, the mass of absorbent is not included in these calculations.

These calculations and the mass balance diagrams included with the process description show all the organic constituents and heavy metals of concern will be significantly reduced below the LDR treatment standards. Furthermore, most of the radionuclides will be removed by the ion exchange resin.

List of Attachments

Attachment 1	Mass Balance Calculations
Attachment 2	Process Flow Diagrams/Mass Balance

Attachment 1
Mass Balance Calculations

6/27



SHEET 1 of 12

CLIENT/SUBJECT INEEL

W.O. NO. _____

TASK DESCRIPTION Mass Balance Calc's

TASK NO. _____

PREPARED BY GAPDEPT 1382 DATE 9/24/2001

APPROVED BY _____

MATH CHECK BY _____

DEPT _____ DATE _____

METHOD REV. BY _____

DEPT _____ DATE _____

DEPT _____ DATE _____

Isotherm Data from Treatability Manual

Compound Residual mg/l B/B GAC

Methylenechloride

1.0

0.0011

0.1

0.09 $\cdot 10^{-3}$

0.01

0.006 $\cdot 10^{-3}$

1,1,1-TCA

5

0.004

1

0.0021

0.01

0.5 $\cdot 10^{-3}$

TCE

10

0.12

1

0.02

0.1

0.0065

0.01

0.002

PCE

10

0.12

1

0.05

0.01

0.0038

1,2-dimethylphenol

0.01

0.012

Phenol

0.01

0.002

1,1,2-DCP

0.01

0.001

Dindano (1,2,3-ox) pyrene

0.01

0.01 (Based on naphth-
lene)

Bis-2 ethylhexyl phthalate

0.01

0.02

3,3-dichlorobenzidine

0.01

0.10

2 or 4 methylphenol

0.01

0.007 (avg of 1,2 methyl
+ phenol)

V-Tanks

V-1

V-2

V-3

Total

mg/l $\cdot 10^3$ B/GACmg/l $\cdot 10^3$ B/GACmg/l $\cdot 10^3$ B/GAC

B/GAC

TCE

0.16

0.859

0.43

0.30

0.336

0.67

0.20

11.7

5.8

6.90

other PCE

0.06

0.322

0.322

0.37

0.927

0.932

0.20

11.7

11.72

0.40

BIA

0.08

0.430

0.0452

0.20

1.855

0.195

0.10

5.85

0.657

13.0

PCE

0.14

0.752

0.20

0.20

22.0

RFW 10-05-003/A-5/85

7/27



SHEET 2 of 12

CLIENT/SUBJECT INEEL

W.O. NO. _____

TASK DESCRIPTION _____

TASK NO. _____

PREPARED BY _____

DEPT _____

DATE _____

APPROVED BY _____

MATH CHECK BY _____

DEPT _____

DATE _____

METHOD REV. BY _____

DEPT _____

DATE _____

DEPT _____ DATE _____

Drum Filling

sludge Contaminant Load (lb 104)
Tank Volume PCE TCE 1,1-TCM MCCP 3,3-DCB Indeno 1,2,3-CD 2-MP 4-MP IPend

13.10	V-1	520/520	12.14	13.88	-	-	-	-	-	-	-	-	-
53.16	V-2	520/520	-	26.02	-	-	-	-	-	-	-	-	-
34.96	V-3	653/653	-	21.78	-	-	-	-	-	-	-	-	-
63.52	V-9	250/170	-	10.94	1.1	1.94	1.7	1.76	0.96	2.01	2.16	2.16	2.68
		3706/1763											
66.74	Totals		12.14	11,003.78	1.54	1.7	1.76	1.76	0.96	2.01	2.16	2.16	2.68

0.539 conc, mg/l 0.039 35.602 5.008 5.095 0.0067 0.0031 0.0048 0.0717 0.0087

Rem (104)
 79.25 gal ext'd 5.73 5234.71 736.35 749.14 0.84 0.46 100 10.54 10.54 1.28

0.29
 1.40
 1.21
 1.60
 4.50

16 GAC 0.15 3.06 (104) 28.71 (1) 54.57 0.0094 0.0092 0.0033 0.15057 0.064

17.86 57.65 219.41 0.38

Total GAC = 298.8 lb

8/27

SHEET 3 of 12CLIENT/SUBJECT INEEL

W.O. NO. _____

TASK DESCRIPTION _____

TASK NO. _____

PREPARED BY _____ DEPT _____ DATE _____

APPROVED BY _____

MATH CHECK BY _____ DEPT _____ DATE _____

METHOD REV. BY _____ DEPT _____ DATE _____

DEPT _____ DATE _____

Ion Exchange for Heavy metalsV-1

Pb	0.84 mg/l	0.406 as CaCO_3	Using a 3 ft ³ unit (Grainger = 20,000 gal) w/ 72 ppm capacity $\frac{360}{10000} = 51.4$ $\frac{51.4}{7.000} = 12.8 \text{ lb as } \text{CaCO}_3$
Hg	0.369 "	0.184	
Co	47.6	119	
Cr	0.4	1.154	
Cu	0.25	0.394	
Fe	12	32.143	Radionuclides 27 mg/l \Rightarrow 2.12 as CaCO_3 \Rightarrow 2.44 lb as CaCO_3 $0.38 \Rightarrow 0.002 + 0.002 = 0.004$ sludge 510 gal \Rightarrow 1.65 lb
Mg	23.1	95.062	
Mn	2.78	5.054	
Ni	0.529	0.901	
Zn	60.3	92.201	
K	104	246.499 + 133.353	
any	246.5 mg/l	\Rightarrow 1.32 lb in 6.41 gal	
	380 "	\Rightarrow 2.04 lb "	

V-2

Co	6.49 mg/l	16.23 as CaCO_3	Radionuclides load = 0.95 mg/l \Rightarrow 0.004 lb + 0.004 lb
Fe	0.437	1.17	
Mg	23.5	14.58	
Mn	0.476	0.86	
Ni	0.457	0.78	
K	276	353.85	sludge 510 gal \Rightarrow 1.68
Zn	0.164	0.25	
		387.72	
any	388	\Rightarrow 1.73 lb in 5.30 gal	

V-3

Co	51.4	128.50	Radionuclides 0.25 mg/l \Rightarrow 0.015 + 0.001 lb
Mg	226	108.33	
Mn	0.765	1.39	
Ni	0.185	0.70	
K	51.7	66.28	
Zn	0.964	1.47	sludge 653 \Rightarrow 1.68
		301.67	
any	308	\Rightarrow 1.797 lb in 6.995 gal	

9/27



SHEET 4 of 12

CLIENT/SUBJECT

NEEL

W.O. NO.

TASK DESCRIPTION

TASK NO.

PREPARED BY

DEPT

DATE

APPROVED BY

MATH CHECK BY

DEPT

DATE

METHOD REV. BY

DEPT

DATE

DEPT

DATE

				Sludge Drum Filling	
Ba	1.02 mg/l	0.746	CaCO ₃	0.088 mg/l	0.064 mg/l
Be	0.065	0.77	V-1 1040	0.088	0.067
Cl	1.9	6.69	V-2 1040	0.132	0.117
Ca	90.6	224.50	V-3 1306	41.12	102.8
Ca	1.46	3.72	V-4 320	0.238	0.687
Ca	0.116	0.20	3786	0.010	0.017
Ca	2.98	4.69		0.327	0.515
Fe	17.9	47.95		4.913	13.16
FR	0.942	0.46		0.317	0.153
Mg	208	866.67		34.59	144.13
Mn	23.5	42.81		3.21	5.84
Hg	0.563	0.28		0.152	0.076
Ni	13.8	23.51		1.194	2.03
K	8340	10,692.31		845.0	1083
Zn	18.2	27.83		18.88	28.87
				1191.008	1381.526 mg/l as
				say 11,911	6.95 lb in 70 gal → 70.969 CaCO ₃
				Radon includes 1452.495	
				say 1452.5	
				liquid Vol = 1763 → 21.36 lb as CaCO ₃	
				inc 1.04 lb for Rad	
Total				Total V-1	2.042
2.041				V-2	1.804
1.65				V-3	17.985
1.80				Sludge	21.36
1.68				43.191 lb as CaCO ₃	
17.977					
1.68					
6.95					
33.77					
say 34 lb as CaCO ₃					
				Standard Resin = 15 kg/l ft ³	
				÷ 7 = 2.14 lb/l ft ³	
				2.02 lb	

10/27

SHEET 5 of 12CLIENT/SUBJECT INEEL

W.O. NO. _____

TASK DESCRIPTION Mass Balance - "Other" Compds

TASK NO. _____

PREPARED BY GAP DEPT 1382 DATE 10/10

APPROVED BY _____

MATH CHECK BY _____ DEPT _____ DATE _____

METHOD REV. BY _____ DEPT _____ DATE _____

DEPT _____ DATE _____

Tank V-1 Water Volume 644
1684 gal
 Isotherm Data

Compd	Residue, µg/l	BB/µg AC	conc. mg/l	LDR mg/l	µg AC
Chloromethane	0.01	0.000065	0.01	0.19	0.00
1,2-DCE	0.01	0.0003	0.05%	NA	0.00
Acenaphthene	0.05	0.30	1	0.059	0.05
Acenaphthylene	0.05	0.08	1	0.059	0.18
Anthracene	0.05	0.04	1	0.059	0.35
Benzo (a) anthracene	0.05	0.02 (K)	1	0.059	0.70
Benzo (a) pyrene	0.05	0.007	1	0.061	2.01
Benzo (b) fluoranthene	0.05	0.02 (K)	1	0.11	0.70
Benzo (g,h,i) perylene	0.005	0.0017	1	0.055	3.2
Benzo (k) fluoranthene	0.05	0.02	1	0.11	0.07
Benzic acid	1.0	0.03*	5	NA	1.40
Benzyl alcohol	0.5	0.02*	1	NA	0.70
Butylbenzylphthalate	0.01	0.0045	1	0.017	3.12
Bis (2-chloroethoxy)methane	0.03	0.005*	1	0.036	2.81
Bis (2-chloroethyl) ether	0.03	0.005	1	0.033	2.81
Bis (2-chloroisopropyl) ether	0.05	0.015	1	0.055	0.94
Bis (2-ethoxyethyl) phthalate	0.05	0.100	0.053	0.26	0.01
4-Bromophenyl-phenyl ether	0.05	0.02	1	0.055	0.07
Chrysene	0.05	0.04 (anthracene)	1	0.059	0.35
4-Chloroaniline (p-chloroaniline)	0.04	0.03*	1	0.46	0.47
4-Chloro-3-Methylphenol (p-chloro-m-cresol)	0.01	0.03*	1	0.018	0.47
2-Chloronaphthalene	0.05	0.05	1	0.055	0.28
2-Chlorophenol	0.04	0.015	1	0.044	0.84
Dibenz(a,h)anthracene	0.05	0.007	1	0.055	2.01

25.15 Total 16.4

RFW 10-05-003/A-5/85

11/27



SHEET 6 of 12

CLIENT/SUBJECT _____

W.O. NO. _____

TASK DESCRIPTION _____

TASK NO. _____

PREPARED BY _____

DEPT _____

DATE _____

APPROVED BY _____

MATH CHECK BY _____

DEPT _____

DATE _____

METHOD REV. BY _____

DEPT _____

DATE _____

DEPT _____

DATE _____

Compd	Residual - mg/l	R/LB GA	Depos. LDK mg/l	LBGAC
1,2-Dichlorobenzene (o-dichlorobenzene)	0.05	0.03	1	0.47
1,3-Dichlorobenzene (m-dichlorobenzene)	0.03	0.02	1	0.70
1,4-Dichlorobenzene (p-dichlorobenzene)	0.05	0.03	1	0.47
3,3-Dichlorobenzidine (Dibenz (a,h) anthracene)	0.05	0.15	1	0.09
2,4-Dichlorophenol	0.04	0.06	1	0.23
Diethylphthalate	0.05	0.085	1	0.16
2,4-Dimethylphenol	0.03	0.02	1	0.70
Dimethylphthalate	0.04	0.028	1	0.51
Di-n-butylphthalate	0.05	0.150	1	0.09
Di-n-octylphthalate	0.01 (avg)	0.080*	1	0.18
2,4-Dinitrophenol	0.05	0.02	5	3.50
2,4-Dinitrotoluene	0.05	0.06	1	0.23
2,6-Dinitrotoluene	0.05	0.05	1	0.28
Fluorethane	0.05	0.10	1	0.14
Fluorene	0.05	0.03	1	0.47
Hexachlorobenzene	0.05	0.04	1	0.23
Hexachlorobutadiene (Hexachloro-1,3-butadiene)	0.05	0.05	1	0.28
Hexachlorocyclopentadiene	0.05	0.20	1	0.07
Hexachloroethane	0.05	0.02	1	3.5
Indeno (1,2,3-cd) pyrene	0.005	0.002* (2 pyrene)	1	7.0
2-Methylphenol (o-cresol)	0.05 0.1	0.03	1	0.47
4-Methylphenol (p-cresol)	0.05 0.5	0.04	1	0.35
Naphthalene	0.05	0.03	1	0.47
2-Nitroaniline (o-nitroaniline)	0.05	0.02*	5	3.5
RFW			32	24.09

12/27



SHEET 7 of 12

CLIENT/SUBJECT _____

W.O. NO. _____

TASK DESCRIPTION _____

TASK NO. _____

PREPARED BY _____

DEPT _____

DATE _____

APPROVED BY _____

MATH CHECK BY _____

DEPT _____

DATE _____

METHOD REV. BY _____

DEPT _____

DATE _____

DEPT _____

DATE _____

Compd	Residual mg/l	lb/lb GAC	Conc mg/l	KDR mg/l	lb GAC
4-Nitroaniline (p-nitroaniline)	0.02	0.02*	5	0.026	3.5
Nitrobenzene	0.05	0.02	1	0.068	0.20
2-Nitrophenol (o-nitrophenol)	0.02	0.02	1	0.028	0.00
4-Nitrophenol (p-nitrophenol)	0.05	0.03	5	0.12	2.34
N-nitroso-di-n-propylamine (Di-n-propylnitrosamine)	0.05	0.01	1	8.4	0.40
N-nitrosodiphenylamine (Diphenylnitrosamine)	0.05	0.01*	1	0.92	0.40
Pentachlorophenol	0.05	0.04	5	0.089	1.96
Phenanthrene	0.05	0.06	1	0.059	0.23
Phenol	0.03	0.003	1	0.039	0.18
Pyrene	0.05	0.04/2*	1	0.067	0.25
Pyridine	0.01	0.02*	1	0.014	0.90
1,2,4-Trichlorobenzene	0.05	0.04	1	0.055	0.35
2,4,6-Trichlorophenol	0.05	0.04*	5	0.18	1.96
2,4,8-Trichlorophenol	0.03	0.04	1	0.035	0.35

30.30
Total 20.22
p.5 total 16.44
p.6 total 24.09
60.75

Correct to water volume = 644

 $\frac{644}{16.84} (60.75) = 23.23 \text{ lb GAC}$ Total mg/l = $30.82 + 32.00 + 25.15 = 87.15 \rightarrow 0.467 \text{ lb}$ Estimated TOC of these compds = $0.7(87.15) = 61 \text{ mg/l}$ Measured TOC = 66 Adjusted lb GAC = $\frac{66}{61}(23.23) = 25.11$



CLIENT/SUBJECT _____ W.O. NO. _____

TASK DESCRIPTION _____ TASK NO. _____

PREPARED BY _____ DEPT _____ DATE _____

APPROVED BY _____

MATH CHECK BY _____ DEPT _____ DATE _____

METHOD REV. BY _____ DEPT _____ DATE _____

DEPT _____ DATE _____

Tank V-2 Water Volume Treated = 556 gal

Other compounds are present at the same concentrations as tank V-1

Adjusted GAC for other compds $\frac{556}{644} (23.23) = 20.06$ lb GAC

TOC due to other compds = 6.1 mg/l (same as V-1)

Measured TOC = 105

Adjusted GAC for all TOC = $\frac{105}{61} (20.06) = 34.53$ lb

Tank V-3 Water Volume Treated = 6995

As with V-2 Adjusted GAC for other compds $\frac{6995}{644} (23.23) = 252.32$ lbAdjust for Measured TOC = 105 $\frac{105}{61} (252.32) = 434.32$ lb

Summary:	lb GAC	lb GAC	lb GAC
V-1	0.43	V-2 0.67	V-3 5.8
	0.20	1.5	13.0
	0.40	34.53	434.32
	25.13	36.60	453.12
	26.16		

1st Stage GAC consumed after V-1, V-2 and 4100 gal of V-3: $26.16 + 36.60 + \frac{4100}{6995} (453.12) = 328.35$ lb

$453.12 - 265.59 = 187.53$ lb GAC used after change out

14/27



SHEET 8 of 12

CLIENT/SUBJECT _____ W.O. NO. _____

TASK DESCRIPTION _____ TASK NO. _____

PREPARED BY _____ DEPT _____ DATE _____

MATH CHECK BY _____ DEPT _____ DATE _____

METHOD REV. BY _____ DEPT _____ DATE _____

APPROVED BY _____

DEPT _____ DATE _____

Drum Filling - other organics calculate composite concentrations / lb GAC
 V-4040gal, V-1040gal
 V-31306gal, V-9-320 → 3706gal, Liquid Volume = 1763gal

Rainbow Ref. V-1,2,3 V-9 Comp LDR

Compound conc mg/L GAC mg/L mg/L mg/L lb GAC

Acenaphthene	0.05	0.30	1	6	1.45	0.059	0.7
Acenaphthylene	0.05	0.08	1	7	1.53	0.059	0.28
Anthracene	0.05	0.04	1	5	1.36	0.059	0.50
Benzo (a) anthracene	0.05	0.02*(K)	1	8	1.62	0.059	1.19
Benzo (a) pyrene	0.05	0.007	1	1	1.00	0.061	2.10
Benzo (b) fluoranthene	0.05	0.02*(K)	1	7	1.53	0.11	1.12
Benzo (g,h,i) perylene	0.005	0.0017	1	3	1.19	0.055	10.29
Benzo (k) fluoranthene	0.05	0.02	1	6	1.45	0.11	1.07
Benzoic acid	1.0	0.05*	5	-	-	NA	-
Benzyl alcohol	0.5	0.02*	1	-	-	NA	-
Bis(2-ethylhexyl)phthalate	0.01	0.0045	1	8	1.62	0.017	5.29
Bis (2-chloroethoxy)methane	0.03	0.005*	1	8	1.62	0.036	4.76
Bis (2-chloroethyl)ether	0.03	0.005	1	7	1.53	0.053	4.55
Bis (2-chloroisopropyl) ether	0.05	0.015	1	6	1.45	0.255	1.42
Bis (2-ethylhexyl) phthalate	0.05	0.100	0.053	38	3.36	0.28	0.49
4-Bromophenyl-phenyl ether	0.05	0.02	1	7	1.53	0.055	1.12
Chrysene	0.05	0.04 (anthracene)	1	8	1.62	0.059	0.60
4-Chloroaniline (p-chloroaniline)	0.04	0.03*	1	27	3.26	0.46	1.60
4-Chloro-3-Methylphenol (p-chloro-m-cresol)	0.01	0.03*	1	8	1.62	0.018	0.79
2-Chloronaphthalene	0.05	0.05	1	10	1.79	0.055	0.53
2-Chlorophenol	0.04	0.015	1	6	1.45	0.044	1.42
Dibenz(a,h)anthracene	0.05	0.007	1	5	1.36	0.055	2.86
					33.34		42.68

RFW 10-05-003/A-6/88

15/27



SHEET 19 of 12

CLIENT/SUBJECT _____

W.O. NO. _____

TASK DESCRIPTION _____

TASK NO. _____

PREPARED BY _____

DEPT _____

DATE _____

APPROVED BY _____

MATH CHECK BY _____

DEPT _____

DATE _____

METHOD REV. BY _____

DEPT _____

DATE _____

DEPT _____

DATE _____

Compound	Residual Conc mg/L	Vol/L GAC	V _{62.5} mg/L	V _{1.9} mg/L	Conc mg/L	LPR mg/L	GAC
1,2-Dichlorobenzene (o-dichlorobenzene)	0.05	0.05	1	210	1906	0.88	9.34
1,3-Dichlorobenzene (m-dichlorobenzene)	0.05	0.02	1	6	1.45	0.034	1.07
1,4-Dichlorobenzene (p-dichlorobenzene)	0.05	0.03	1	49	516	0.09	2.53
2,3-Dichlorobenzidine (2,3-Dichloro-4,5-diaminobenzene)	0.05	0.15	1	66		0.055	-
2,4-Dichlorophenol	0.04	0.06	1	8	1.62	0.044	0.40
Diethylphthalate	0.05	0.055	1	8	1.62	0.2	0.28
2,4-Dimethylphenol	0.03	0.02	1	79		0.036	-
Dimethylphthalate	0.04	0.028	1	7	1.53	0.047	0.80
Di-n-butylphthalate	0.05	0.150	1	3	1.19	0.057	0.12
Di-n-octylphthalate	0.01	0.080*	1	6	1.45	0.017	0.27
2,4-Dinitrophenol	0.05	0.02	5	27	6.97	0.12	5.12
2,4-Dinitrotoluene	0.05	0.06	1	10	1.79	0.32	0.44
2,5-Dinitrotoluene	0.05	0.05	1	8	1.62	0.55	0.48
Fluoranthene	0.05	0.10	1	8	1.62	0.068	0.24
Fluorene	0.05	0.03	1	5	1.36	0.059	0.67
Hexachlorobenzene	0.05	0.04	1	7	1.53	0.055	0.37
Hexachlorobutadiene (Hexachloro-1,3-butadiene)	0.05	0.05	1	10	1.79	0.055	0.53
Hexachlorocyclopentadiene	0.05	0.20	1	13	2.05	0.057	0.15
Hexachloroethane	0.05	0.02	1	8	1.62	0.055	1.19
Indene (1,2,3-cd)pyrene	0.005	0.002 (2 mg/L)	1	36		0.055	-
2-Methylphenol (o-cresol)	0.05	0.1	1			0.11	-
4-Methylphenol (p-cresol)	0.05	0.5	1			0.77	-
Naphthalene	0.05	0.03	1	8	1.62	0.059	0.79
2-Nitroaniline (o-nitroaniline)	0.05	0.02*	5	6	1.45	0.27	1.07

56.50

25.84

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SHEET 10 of 12

CLIENT/SUBJECT _____ W.O. NO. _____

TASK DESCRIPTION _____ TASK NO. _____

PREPARED BY _____ DEPT _____ DATE _____

MATH CHECK BY _____ DEPT _____ DATE _____

METHOD REV. BY _____ DEPT _____ DATE _____

APPROVED BY _____

DEPT. _____ DATE _____

Comp'd	Residual Conc. mg/L	1,2,3 mg/L	1,9 mg/L	Composite mg/L	1,2,3 mg/L	GAC
4-Nitroaniline (p-nitroaniline)	0.02	0.02*	5	4	4.99	0.028 3.67
Nitrobenzene	0.05	0.02	1	9	1.71	0.068 1.26
2-Nitrophenol (o-nitrophenol)	0.02	0.02	1	7	1.53	0.028 1.12
4-Nitrophenol (p-nitrophenol)	0.05	0.03	5	37	7.84	0.12 3.84
N-nitroso-di-n-propylamine (Di-n-propylnitrosamine)	0.05	0.01	1	13	2.05	0.4 3.01
N-nitrosodiphenylamine (Diphenylnitrosamine)	0.05	0.04	1	13	1.79	0.92 2.63
Pentachlorophenol	0.05	0.04	5	13	5.76	0.059 2.12
Phenanthrene	0.05	0.06	1	6	1.45	0.059 0.36
Phenol	0.05	0.03	1	100	9.56	0.032 -
Pyrene	0.05	0.04*	1	12	1.96	0.067 0.72
Pyridine	0.01	0.02*	1	10	1.79	0.014 1.32
1,2,4-Trichlorobenzene	0.05	0.04	1	7	1.53	0.055 0.56
2,4,5-Trichlorophenol	0.05	0.04*	5	17	6.11	0.18 2.25
2,4,6-Trichlorophenol	0.03	0.04	1	10	1.79	0.035 0.66

40.30 Total 23.52

33.34 p. 8 42.68

56.50 p. 10 25.86

130.14 92.06 lb

Total mg/L of other comp'ds = 130.14 mg/L

Estimated TOC of these comp'ds = 0.7 (130.14) = 91.10

Measured TOC of Composite: 1040(66) + 1040(105) + 1306(105) + 320(3) = 3706 = 85 mg/L

Actual conc. in 1,9 < detection levels. GAC 85 / 130 (12.06) = 60.19 lb

RFPW 10-05-002/A-5/85

8702567100:#16

WESTON BLDG 4-2-

: 10-13-1 : 12:19 :

SENT BY: (610) 701-9187

17/27



SHEET 12 of 12

CLIENT/SUBJECT _____

W.O. NO. _____

TASK DESCRIPTION _____

TASK NO. _____

PREPARED BY _____

DEPT _____

DATE _____

APPROVED BY _____

MATH CHECK BY _____

DEPT _____

DATE _____

METHOD REV. BY _____

DEPT _____

DATE _____

DEPT _____

DATE _____

Total GAC Use

Liquid Treat V-1, 2, 3 (p.1)	22.0
Drum Filling (p.2)	294.3
TOC V-1 (p.7)	25.1
TOC V-2 (p.8)	34.5
TOC V-3 (p.8)	434.3
TOC Drum Filling (p.11)	60.2
	<u>870.4</u>

Drum Filling O & G

$$1040(4.17) + 1040(1) + 1306(4.29) + 320(0) = 2,917.18$$

$$TSS: 1040(8) + 1040(26.7) + 1306(65.3) + 320(1.6) = 32,900.1$$

$$\text{Liquid Rad: } 1040(2.90 \cdot 10^6) + 1040(4.90 \cdot 10^6) + 1306(12.34 \cdot 10^6) + 320(4.18 \cdot 10^6) = 6.70 \cdot 10^6$$

$$Cl 137: 1040(2.90 \cdot 10^6) + 1040(13.5 \cdot 10^6) + 1306(4.23 \cdot 10^6) + 320(0.42 \cdot 10^6) = 6.13 \cdot 10^6$$

Sludge

$$Sn 90: 1040(7.70 \cdot 10^6) + 1040(10.96 \cdot 10^6) + 1306(21.62 \cdot 10^6) + 320(6.40 \cdot 10^6) = 12.41 \cdot 10^6$$

$$Cl 137: 1040(8.30 \cdot 10^6) + 1040(6.19 \cdot 10^6) + 1306(7.59 \cdot 10^6) + 320(5.59 \cdot 10^6) = 7.36 \cdot 10^6$$

18/27

Tank V-1, Preliminary Liquid Phase Radioactive Material				
Radionuclide	Activity Detected (pCi/L)	Specific Activity (Ci/g)	Activity Detected (mg/L)	Equiv. CaCO ₃ Concentration (mg/L)
U-234	1.89E+04	6.17E-03	0.003063209	0.001309064
U-235	5.68E+02	2.14E-06	0.264485981	0.112547226
U-238	2.10E+02	3.33E-07	0.830630631	0.264870853
Pu-238	2.24E+02	17.39	1.2881E-08	5.41217E-09
Pu-239	1.05E+02	8.13E-02	1.71289E-06	7.16689E-07
Am-241	1.97E+02	3.24	6.08025E-08	2.52282E-08
Cm-242	U (8.61)	3.32E+03	NA	NA
Cm-243	8.42E+01	46	1.39565E-09	5.74342E-10
Np-237	U (26.7)	7.05E-04	NA	NA
Sr-90	2.03E+06	141	1.43972E-05	1.59988E-05
Ag-108m	U (776)	6.37E+02	NA	NA
Ag-110m	U (1270)	4.66E+03	NA	NA
Am-241	U (1350)	3.24	NA	NA
Ce-144	U (7530)	3.19E+03	NA	NA
Co-58	U (2160)	3.16E+04	NA	NA
Co-60	1.55E+04	1.13E+03	1.37168E-08	2.28614E-08
Cs-134	U (734)	1.30E+03	NA	NA
Cs-137	2.90E+06	87	3.33333E-05	2.43309E-05
Eu-152	U (4860)	1.85E+02	NA	NA
Eu-154	U (1860)	1.45E+02	NA	NA
Eu-155	U (2420)	1.27E+03	NA	NA
Mn-54	U (755)	7.98E+03	NA	NA
Nb-95	U (2400)	3.93E+04	NA	NA
Ra-226	U (1260)	9.88E-01	NA	NA
Ru-103	U (12900)	3.21E+04	NA	NA
Ru-106	U (9430)	3.38E+03	NA	NA
Sb-125	U (3870)	1.06E+03	NA	NA
U-235	U (1340)	2.14E-06	NA	NA
Zn-65	U (1730)	8.20E+03	NA	NA
Zr-95	U (4300)	2.10E+04	NA	NA
I-129	U (252)	1.83E-04	NA	NA
H-3	3.04E+07	9.84E+03	3.15353E-06	0.000105118
Ni-63	2.88E+05	61.7	4.86775E-08	7.40912E-06
		total	0.898237174	0.378980788

*mg/L = (pCi/L)*10⁻¹²(Ci/pCi)*10³(mg/g)/Specific Activity (Ci/g)

*equiv. CaCO₃ was calculated assuming divalent radionuclide

19/27

Tank V-2, Preliminary Liquid Phase Radioactive Material				
Radionuclide	Activity Detected (pCi/L)	Specific Activity (Ci/g)	Activity Detected (mg/L)	Equiv. CaCO ₃ Concentration (mg/L)
U-234	3.88E+04	6.17E-03	0.006256078	0.002673538
U-235	1.80E+03	2.14E-06	0.747863551	0.318154703
U-238	4.99E+02	3.33E-07	1.498498498	0.629621218
Pu-238	4.75E+02	17.39	2.73145E-08	1.14767E-08
Pu-239	2.83E+02	8.13E-02	4.61684E-08	1.93165E-08
Am-241	5.89E+01	3.24	1.8179E-08	7.54318E-09
Cm-242	U (4.96)	3.32E+03	NA	NA
Cm-243	1.62E+01	48	3.52174E-10	1.44928E-10
Np-237	U (27.6)	7.05E-04	NA	NA
Sr-90	4.90E+08	141	3.47518E-05	3.86131E-05
Ag-108m	U (3960)	6.37E+02	NA	NA
Ag-110m	U (7120)	4.66E+03	NA	NA
Am-241	U (15900)	3.24	NA	NA
Ce-144	U (37800)	3.19E+03	NA	NA
Co-58	U (1800)	3.18E+04	NA	NA
Co-60	1.30E+04	1.13E+03	1.15044E-08	1.9174E-08
Cs-134	U (764)	1.30E+03	NA	NA
Cs-137	1.35E+07	87	0.000155172	0.000113285
Eu-152	U (4780)	1.85E+02	NA	NA
Eu-154	U (1820)	1.45E+02	NA	NA
Eu-155	U (14400)	1.27E+03	NA	NA
Mn-54	U (716)	7.98E+03	NA	NA
Nb-95	U (1960)	3.93E+04	NA	NA
Ra-226	U (4100)	9.88E-01	NA	NA
Ru-103	U (38000)	3.21E+04	NA	NA
Ru-106	U (46200)	3.38E+03	NA	NA
Sb-125	U (18400)	1.08E+03	NA	NA
U-235	U (6450)	2.14E-06	NA	NA
Zn-65	U (1700)	8.20E+03	NA	NA
Zr-95	U (3210)	2.10E+04	NA	NA
I-129	U (169)	1.83E-04	NA	NA
H-3	1.02E+08	9.64E+03	1.05809E-05	0.000352697
Ni-63	4.48E+05	81.7	7.26094E-06	1.15253E-05
total			2.252630568	0.950967528

*mg/L = (pCi/L)*10⁻¹²(Ci/pCi)*10³(mg/g)/Specific Activity (Ci/g)*equiv. CaCO₃ was calculated assuming divalent radionuclide

20/27

Tank V-3, Preliminary Liquid Phase Radioactive Material				
Radionuclide	Activity Detected (pCi/L)	Specific Activity (Ci/g)	Activity Detected (mg/L)	Equiv. CaCO ₃ Concentration (mg/L)
U-234	1.33E+04	8.17E-03	0.002155592	0.000921193
U-235	4.01E+02	2.14E-08	0.187383178	0.079737522
U-238	1.35E+02	3.33E-07	0.405405405	0.170338406
Pu-238	3.83E+01	17.39	2.20242E-09	9.25385E-10
Pu-239	1.97E+01	8.13E-02	3.2137E-07	1.34465E-07
Am-241	3.18E+01	3.24	9.81481E-09	4.07254E-09
Cm-242	U (6.18)	3.32E+03	NA	NA
Cm-243	U (8.28)	46	NA	NA
Np-237	U (36.4)	7.05E-04	NA	NA
Sr-90	1.23E+07	141	8.7234E-05	9.69287E-05
Ag-108m	U (343)	6.37E+02	NA	NA
Ag-110m	U (906)	4.66E+03	NA	NA
Am-241	U (1780)	3.24	NA	NA
Ce-144	U (3000)	3.19E+03	NA	NA
Co-58	U (284)	3.16E+04	NA	NA
Co-60	1.48E+04	1.13E+03	1.30973E-08	2.18289E-08
Cs-134	4.49E+02	1.30E+03	NA	NA
Cs-137	4.23E+06	87	4.86207E-05	3.54898E-05
Eu-152	U (893)	1.85E+02	NA	NA
Eu-154	U (213)	1.45E+02	NA	NA
Eu-155	U (1170)	1.27E+03	NA	NA
Mn-54	U (108)	7.98E+03	NA	NA
Nb-95	U (318)	3.93E+04	NA	NA
Ra-226	U (332)	9.88E-01	NA	NA
Ru-103	U (5840)	3.21E+04	NA	NA
Ru-106	U (4080)	3.36E+03	NA	NA
Sb-125	U (1900)	1.08E+03	NA	NA
U-235	U (533)	2.14E-08	NA	NA
Zn-65	U (237)	8.20E+03	NA	NA
Zr-95	U (549)	2.10E+04	NA	NA
I-129	U (108)	1.63E-04	NA	NA
H-3	6.09E+06	9.64E+03	8.31743E-07	2.10581E-05
Ni-63	2.05E+05	61.7	3.32253E-06	5.27385E-06
total			0.59508433	0.25115603

*mg/L = (pCi/L) * 10⁻¹² (Ci/pCi) * 10³ (mg/g) / Specific Activity (Ci/g)

*equiv. CaCO₃ was calculated assuming divalent radionuclide

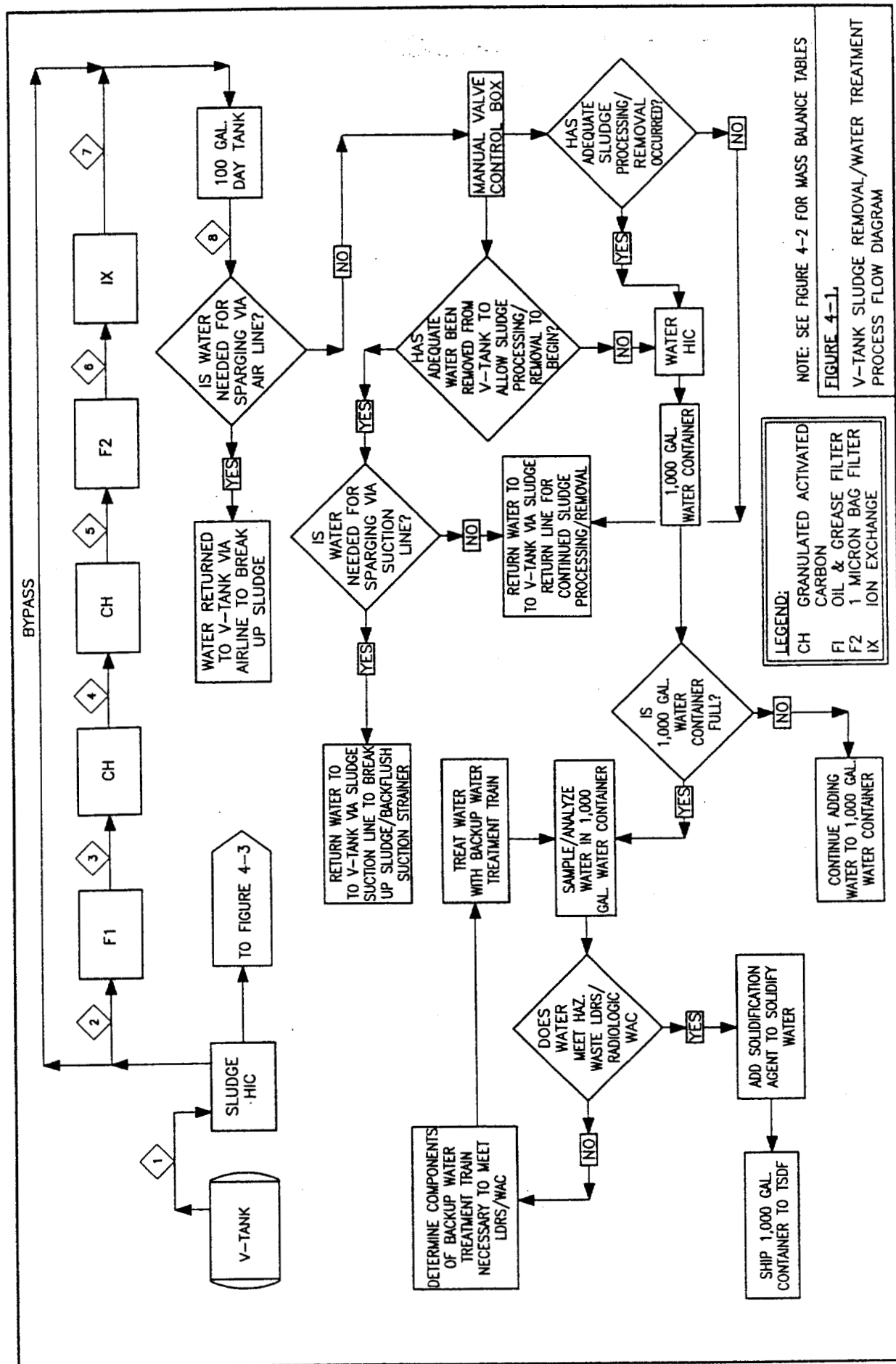
21/22

Tank V-9, Preliminary Liquid Phase Radioactive Material				
Radionuclide	Activity Detected (pCi/L)	Specific Activity (Ci/g)	Activity Detected (mg/L)	Equiv. CaCO ₃ Concentration (mg/L)
U-233	1.24E+04	6.17E-03	0.00201005	0.000882683
U-234	2.11E+05	6.17E-03	0.034197731	0.014614415
U-235	6.90E+03	2.14E-08	3.224299065	1.372042155
U-236	3.26E+03	3.33E-07	9.78978979	4.148216013
U-238	9.72E+02	3.33E-07	2.918918919	1.226438521
Pu-238	1.70E+05	8.13E-02	0.002773246	0.00116523
Pu-239	4.53E+04	6.13E-02	0.000738989	0.0003092
Am-241	4.02E+04	3.24	1.24074E-05	5.1483E-08
H-3	3.53E+08	9.84E+03	3.68183E-05	0.001220609
Cm-244	5.21E+03	46.1062	1.13E-07	4.63115E-08
Np-237	2.00E+02	7.05E-04	0.000283688	0.0001197
Total Sr	4.90E+08	141	3.47518E-05	3.86131E-05
Co-60	1.18E+03	1.13E+03	1.04425E-09	1.74041E-09
Cs-137	4.20E+05	87	4.82759E-06	3.52379E-06
Eu-152	5.66E+02	1.85E+02	3.05946E-09	2.0128E-09
Eu-154	2.72E+02	1.45E+02	1.87586E-09	1.21809E-09
total			15.97109015	6.784171178

*mg/L = (pCi/L)*10⁻¹²(Ci/pCi)*10³(mg/g)/Specific Activity (Ci/g)

*equiv. CaCO₃ was calculated assuming divalent radionuclide

Attachment 2
Process Flow Diagrams/Mass Balance



TANK V-1 MASS BALANCE								
STREAM NO.	1	2	3	4	5	6	7	8
STREAM DESCRIPTION	SLUDGE HIC INFLUENT	F1	CH FEED	CH FEED	F2 FEED	IX FEED	DAY TANK	EFFLUENT
FLOW RATE	10	10	10	10	10	10	10	10
VOLUME	1684	644	644	644	644	644	644	644
LEAD	0.84	0.84	0.84	0.84	0.84	0.84	0.04	0.04
MERCURY	0.369	0.369	0.369	0.369	0.369	0.369	0.018	0.018
TETRACHLOROETHENE	0.14	0.14	0.14	0.02	< 0.01	< 0.01	< 0.01	< 0.01
TRICHLOROETHENE	0.16	0.16	0.16	0.02	< 0.01	< 0.01	< 0.01	< 0.01
TOC	66	66	66	3	< 0.3	< 0.3	< 0.3	< 0.3
Sr-90	7.708 E + 06	2.03 E + 06	2.03 E + 06	2.03 E + 06	2.03 E + 06	2.03 E + 06	2.03 E + 05	2.03 E + 05
Cs-137	8.806 E + 06	2.90 E + 06	2.90 E + 06	2.90 E + 06	2.90 E + 06	2.90 E + 06	2.90 E + 05	2.90 E + 05
OIL & GREASE	4.17	8	1	< 1	< 1	< 1	< 1	< 1
TOTAL SUSPENDED SOLIDS	-	1.00	1.00	1.00	1.00	1.00	1.00	1.00
SPECIFIC GRAVITY	1.02	1.00	1.00	1.00	1.00	1.00	1.00	1.00

TANK V-2 MASS BALANCE								
STREAM NO.	1	2	3	4	5	6	7	8
STREAM DESCRIPTION	SLUDGE HIC INFLUENT	F1	CH FEED	CH FEED	F2 FEED	IX FEED	DAY TANK	EFFLUENT
FLOW RATE	10	10	10	10	10	10	10	10
VOLUME	1596	556	556	556	556	556	556	556
TRICHLOROETHENE	0.30	0.30	0.30	0.02	< 0.01	< 0.01	< 0.01	< 0.01
TOC	105	105	105	5	< 0.5	< 0.5	< 0.5	< 0.5
Sr-90	1.096 E + 07	4.90 E + 06	4.90 E + 06	4.90 E + 06	4.90 E + 06	4.90 E + 06	4.90 E + 05	4.90 E + 05
Cs-137	6.192 E + 06	1.35 E + 07	1.35 E + 07	1.35 E + 07	1.35 E + 07	1.35 E + 07	1.35 E + 06	1.35 E + 06
OIL & GREASE	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
TOTAL SUSPENDED SOLIDS	-	26.7	1	< 1	< 1	< 1	< 1	< 1
SPECIFIC GRAVITY	1.02	1.00	1.00	1.00	1.00	1.00	1.00	1.00

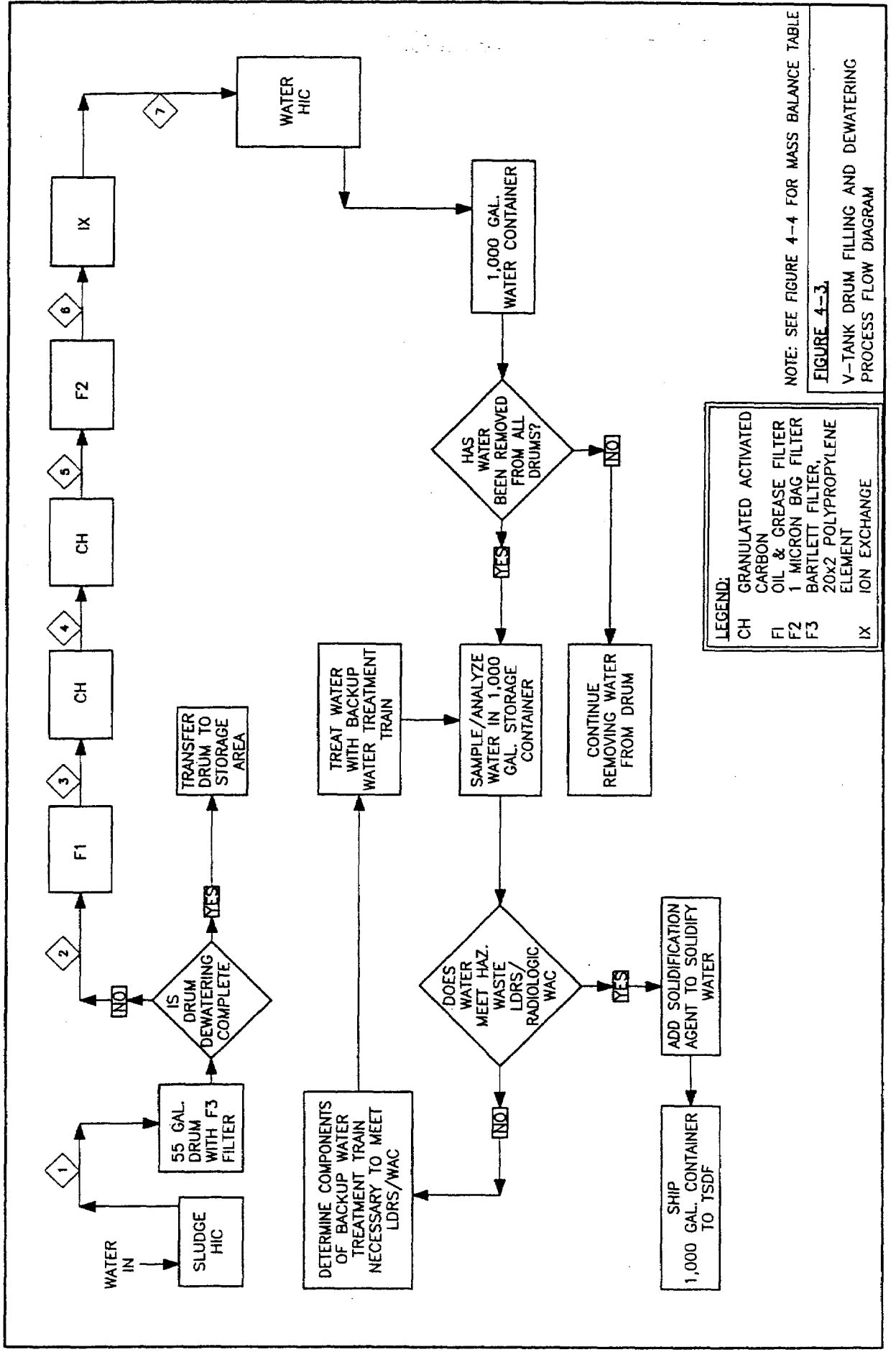
TANK V-3 MASS BALANCE								
STREAM NO.	1	2	3	4	5	6	7	8
STREAM DESCRIPTION	SLUDGE HIC INFLUENT	F1	CH FEED	CH FEED	F2 FEED	IX FEED	DAY TANK	EFFLUENT
FLOW RATE	10	10	10	10	10	10	10	10
VOLUME	8301	6995	6995	6995	6995	6995	6995	6995
TRICHLOROETHENE	0.20	0.20	0.20	0.01	< 0.01	< 0.01	< 0.01	< 0.01
TOC	105	105	105	5	< 0.5	< 0.5	< 0.5	< 0.5
Sr-90	2.162 E + 07	1.23 E + 07	1.23 E + 07	1.23 E + 07	1.23 E + 07	1.23 E + 07	1.23 E + 06	1.23 E + 06
Cs-137	7.596 E + 06	4.23 E + 06	4.23 E + 06	4.23 E + 06	4.23 E + 06	4.23 E + 06	4.23 E + 05	4.23 E + 05
OIL & GREASE	4.29	4.29	1.00	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
TOTAL SUSPENDED SOLIDS	-	65.3	5	< 1	< 1	< 1	< 1	< 1
SPECIFIC GRAVITY	1.02	1.00	1.00	1.00	1.00	1.00	1.00	1.00

TANK V-9 CONCENTRATIONS		
STREAM NO.		1
STREAM DESCRIPTION		SLUDGE HIC INFLUENT
FLOW RATE	GPM	40
VOLUME	GAL	320
CADMIUM	mg/L	1.9
MERCURY	mg/L	0.563
LEAD	mg/L	0.942
NICKEL	mg/L	13.8
METHYLENE CHLORIDE	mg/L	59.0
1, 1, 1-TRICHLOROETHANE	mg/L	58.0
TRICHLOROETHENE	mg/L	410.0
3, 3-DIMETHYLBENZIDINE	mg/L	0.068
2, 4-DIMETHYLPHENOL	mg/L	0.079
INDENO (1,2,3-CD) PYRENE	mg/L	0.036
2-METHYLPHENOL	mg/L	0.83
PHENOL	mg/L	0.1
TOC	mg/L	3
Sr-90	pc/L	6.405 E + 06
Cs-137	pc/L	5.590 E + 06
OIL & GREASE	mg/L	-
TOTAL SUSPENDED SOLIDS	mg/L	-
SPECIFIC GRAVITY	mg/L	1.02

LEGEND:	
CH	GRANULATED ACTIVATED CARBON
F1	OIL & GREASE FILTER
F2	1 MICRON BAG FILTER
IX	ION EXCHANGE

NOTE: SEE FIGURE 4-1 FOR PROCESS FLOW DIAGRAM
FIGURE 4-2.

V-TANK SLUDGE REMOVAL/WATER TREATMENT
PROCESS FLOW MASS BALANCE TABLES



DRUM DEWATERING COMPOSITE MASS BALANCE									
STREAM NO.	1	2	3	4	5	6	7	LDR WASTEWATER TREATMENT STANDARD	
STREAM DESCRIPTION	F3	F1	CH	CH	F2	IX FEED	WATER HIC FEED		
FLOW RATE	10	10	10	10	10	10	10		
VOLUME, GAL	3706	1763	1763	1763	1763	1763	1763		
LEAD, mg/L	0.317	0.317	0.317	0.317	0.317	0.317	0.016		
MERCURY, mg/L	0.152	0.152	0.152	0.152	0.152	0.152	0.008		
NICKEL, mg/L	1.194	1.194	1.194	1.194	1.194	1.194	0.060		
CADMIUM, mg/L	0.132	0.132	0.132	0.132	0.132	0.132	0.007		
TETRACHLOROETHENE, mg/L	0.039	0.039	0.039	0.039	0.039	0.039	0.001		
TRICHLOROETHENE, mg/L	35.602	35.602	35.602	1.80	0.05	0.05	0.05		
METHYLENE CHLORIDE, mg/L	5.008	5.008	5.008	0.25	0.01	0.01	0.01		
1, 1, 1-TRICHLOROETHANE, mg/L	5.095	5.095	5.095	0.25	0.01	0.01	0.01		
3, 3, 5-DICHLOROBENZIDENE, mg/L	0.0057	0.0057	0.0057	0.0057	0.0057	0.0057	0.0055		
2, 4-DIMETHYLPHENOL, mg/L	0.0068	0.0068	0.0068	0.0068	0.0068	0.0068	0.036		
INDENO, mg/L	0.0031	0.0031	0.0031	0.0031	0.0031	0.0031	0.0055		
2-METHYLPHENOL, mg/L	0.0717	0.0717	0.0717	0.0717	0.0717	0.0717	0.11		
4-METHYLPHENOL, mg/L	0.0717	0.0717	0.0717	0.0717	0.0717	0.0717	0.77		
PHENOL, mg/L	0.0087	0.0087	0.0087	0.0087	0.0087	0.0087	0.039		
TOC, mg/L	85	85	85	4	0.5	0.5	VARIES		
Sr-90, pCi/L	1.341 E + 07	6.70 E + 06	6.70 E + 06	6.70 E + 06	6.70 E + 06	6.70 E + 06	6.70 E + 05		
CS-137, pCi/L	7.369 E + 06	6.13 E + 06	6.13 E + 06	6.13 E + 06	6.13 E + 06	6.13 E + 06	6.13 E + 05		
OIL & GREASE, mg/L	2.96	2.96	1.00	0.1	0.1	0.1	0.1		
TOTAL SUSPENDED SOLIDS, mg/L	32.1	32.1	1	1	1	1	1		
SPECIFIC GRAVITY	1.02	1.00	1.00	1.00	1.00	1.00	1.00		

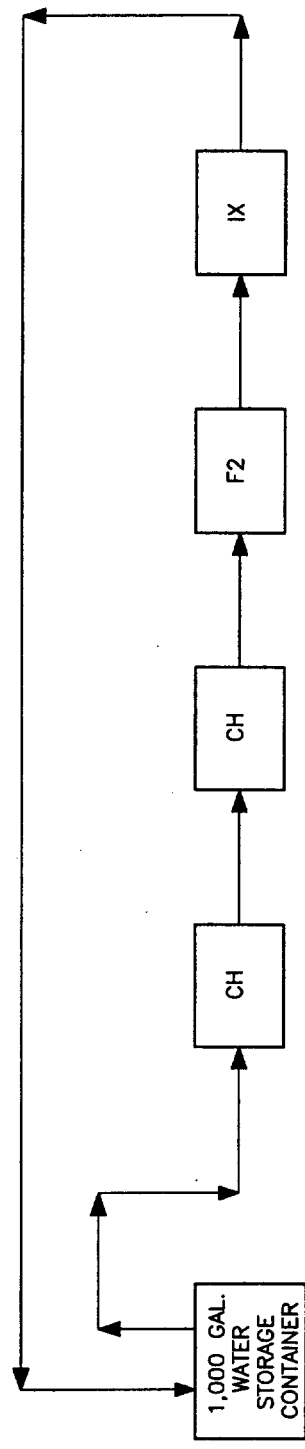
LEGEND:

- CH GRANULATED ACTIVATED CARBON
- F1 OIL & GREASE FILTER
- F2 1 MICRON BAG FILTER
- F3 BARTLETT FILTER, 20x2 POLYPROPYLENE ELEMENT
- IX ION EXCHANGE

NOTE: SEE FIGURE 4-3 FOR PROCESS FLOW DIAGRAM

FIGURE 4-4.

V-TANK DRUM FILLING AND DEWATERING
PROCESS FLOW COMPOSITE MASS BALANCE TABLE



LEGEND:	
CH	GRANULATED ACTIVATED CARBON
F2	1 MICRON BAG FILTER
IX	ION EXCHANGE

FIGURE 4-5.
V-TANK BACKUP WATER TREATMENT
PROCESS FLOW DIAGRAM

CALCULATION COVER SHEET



Project:	INEEL V-Tank Waste				Number of Sheets: 1 of 27
Site:	Test Area North (TAN) Waste Area Group (WAG) 1 Technical Support Facility (TSF) 09 & 18				
Calculation Number:	ABQ13 – HP005	Work Order Number:	12393.002.001		
Subject:	Quantity Determination of V-Tank Pipe Wastes and V Tank Debris With Respect to DOT Packaging Requirements and Classification per 10 CFR §61.55				
Rev #	Date:	Revision:	Calculated by:	Checked by:	Approved:
RAA	6/27/01	90% Polish	Gordon Harris Ken Schaus	Berg Keshian	
RAB	9/27/01	Draft Final	Gordon Harris	Berg Keshian	Dan Brennecke
RAC	10/23	Draft Final Polish	Gordon Harris	Berg Keshian	Jim Lockhart
					<i>[Signature]</i> 10/27/01

Problem Statement:

Determine the disposal and packaging requirements for the pipe and tanks (assuming that it contains a uniformly distributed residue on the inside of the pipe). Determine the amount of pipe that can be shipped in one package that does not exceed a *Type A quantity* (per the DOT definition specified at 49 CFR §173.403).

Determine the quantity of sludge heel that can remain in a tank (assuming that it contains a uniformly distributed residue on the inside of the tank) that does not exceed a *Type A quantity* (per the DOT definition specified at 49 CFR §173.403).

Method of Solution:

Pipe:

Utilizing standard mathematical formulas for geometric shapes and standard constants for metric conversions, calculate the volume per foot of 4 and 6-inch diameter pipe and convert this volume to gallons. Next, using characterization data and volume estimates from references above, calculate the total maximum activity of the sludge or solid phase for Tank V-3. Finally, calculate the maximum (total) linear feet of pipe that can be determined to not exceed a *Type A quantity* per package as specified in 49 CFR §173.403.

Then, assume that the maximum linear feet of pipe will be packaged into a suitable container in which the volume of the waste container is not greater than 10% of the volume of waste. Based on the final container volume determines the 10 CFR 61.55 classification.

Tank:

Utilizing standard mathematical formulas for geometric shapes and standard constants for metric conversions, calculate the approximate volume of sludge heel in gallons that can remain in tank upon completion of contents removal. Next, using characterization data and volume estimates from references above, calculate the total maximum activity of the sludge or solid phase for Tank V-3. Finally, calculate the maximum (total) amount of sludge that could remain on the inside of the tank that can be determined to not exceed a *Type A quantity* per package as specified in 49 CFR §173.403.

Then, assuming that the above waste is stabilized within the tank using a suitable solidification media, determine the 10 CFR 61.55 classification based on the solidified waste volume.

Calculation:

Input data, specifications, and applicable regulatory criteria into Excel 97 (or DOT) spreadsheets that have been designed and validated to determine appropriate DOT shipping criteria and 10 CFR §61.55 classification. Note that these spreadsheets are attached as referenced herein.

Note: The DOT spreadsheet contains formulas that have been validated or "check printed" to ensure cells are referenced correctly and arithmetic operations and algebraic calculations are correct. The spreadsheet is then "locked" using the password protection function. The values and subsequent determinations that the algebraic formulas calculate have been independently verified using RADCALC software available through the DOE/NTP website. Calculations are also independently verified using a Hewlett-Packard model 48G+ hand held calculator.

Assumptions:

1. Each pipe contains a uniformly distributed residue on the inside that is .25 inches thick for both the 4 and 6-inch pipes.
2. Evaluate the 6-inch pipe with only 1/16th inch of waste to determine the disposal requirements.
3. Tank V-3 is assumed to have the highest representative activity of all V-Tank solid phase wastes and is therefore suitable to represent the worst case scenario for determining the volume limit of ancillary tank pipe and tank sludge heel for packaging and disposal.
4. In accordance with Low-level Waste Licensing Branch Technical Position on Radioactive Waste Classification (May 1983, Rev. 0); (c)(2): Radionuclide concentrations should be determined based upon

- volume or weight of the final waste form, or (3) in many cases, the volume used for waste classification purposes may be considered to correspond to the volume of the waste container.
5. The tank contents can be uniformly distributed within a suitable solidification media.
 6. This evaluation does not evaluate V-Tank wastes for compliance with the waste acceptance criteria (WAC) of any disposal facility or with respect to RCRA/TSCA constituents.
 7. The numbers derived by the DOT spreadsheets should be used as estimates only. The determinations made by interpretation of the data in the DOT spreadsheets should be carefully considered with respect to the quality of the radiological characterization data provided.
 8. With regards to the characterization data, when a radionuclide was not detected, its detection limit was used as a conservative estimate. Note that this conservative assumption has essentially no effect on the overall determinations.
 9. Th-234 and Pa-233 are assumed to be in secular equilibrium with the parent radionuclides, U-238 and Np-237 respectively; their activities have been added as appropriate.
 10. In accordance with 49 CFR §173.433 requirements, the activity of Pu-241 has been added at 9.52 times the activity of Am-241.

Sources of Data:

Characterization Data from:

Comprehensive Remedial Investigation/Feasibility Study (RI/FS) for Test Area North Operable Unit 1-10 at INEEL, DOE/ID-10557, November 1997, Dept. of Energy/Idaho Operations Office, Idaho Falls, ID.

V-Tank Waste Volumes from:

Memorandum from Carolyn S. Blackmore to J. Todd Taylor, 03/10/98, *Criticality Safety Issues Associated With The Test Area North V-Tanks* – CSB-004-98, Lockheed Martin Idaho Technologies Company

Formulas for Geometric Calculations:

CRC Standard Mathematical Tables, 26th Edition, William H. Beyer, Ph.D., CRC Press, Inc. Boca Raton, Florida

Conversion Factors and Constants:

The Health Physics and Radiological Health Handbook, Revised Edition, Edited by Bernard Schleien, 1992, Scinta, Inc. Silver Spring, Maryland.

Regulatory Requirements from:

49 CFR 171-178, October 2000, "Transportation," Parts 171 through 178, "General Information, Regulations, and Definitions, Hazardous Materials Tables, and Shipping and Packaging Requirements," *Code of Federal Regulations*, Office of the Federal Register.

10 CFR 61, October 2000, "Energy," Part 61, "Licensing Requirements for Land Disposal of Radioactive Waste," *Code of Federal Regulations*, Office of the Federal Register.

Issuance of Final Branch Technical Position on Concentration Averaging & Encapsulation, revision in part to waste classification technical position, January 17, 1995, Nuclear Regulatory Agency, Washington D.C.

Low-level Waste Licensing Branch Technical Position on Radioactive Waste Classification, May 1983, Rev. 0, Nuclear Regulatory Commission, Washington, D.C.

Calculation:

Piping:

Referring to the Attachments 1 through 3, the radionuclide activities used in these spreadsheets are from the characterization data provided in *Comprehensive Remedial Investigation/Feasibility Study (RI/FS) for Test Area North Operable Unit 1-10 at INEEL* (DOE/ID-10557, November 1997), which was provided by INEEL personnel in electronic format (i.e., Excel spreadsheets). The characterization data was converted from picocuries per gram (pCi/g) to curies (Ci). Average data values were then calculated for each radionuclide for the Tank V-3 solid or sludge phase. The solid or sludge density was converted from the applicable Tank V-3 analytical data and converted to g/cc.

The total activity for Tank V-3 was then calculated using average activities (refer to attachment 1). The data was then copied into another DOT spreadsheet manipulating the volume of waste, weight, and percent of total activity before copying. The amount of waste and percent activity is dependent upon a reasonable assumption of the amount of sludge residue remaining in the pipe (refer to attachment 2). The total linear feet of pipe allowed per package that will not exceed a Type A quantity, is a function of the total amount of sludge per package that does not exceed a Type A quantity. The total amount of sludge per package (that does not exceed a Type A quantity) can be determined by plotting a graph of gallons versus Type A Package unity calculation and then interpolating the number of gallons at 99 percent of the Type A quantity limit. Once the total amount of sludge per package is known, the dividend of the total amount of sludge per package and the amount of sludge in one linear foot of pipe is the total amount of pipe allowed per package that will not exceed a DOT Type A quantity.

The volume per linear foot of 4 and 6-inch diameter pipe and the volume and weight of sludge per linear foot are calculated in attachment 4. The results of the analysis shows that the pipe can be packaged as LSA II materials but because of the Sr-90 levels assumed, even 1/16 inch of sludge results in the pipe being classified as a Class B waste. (Attachment 2)

Tank:

The spreadsheets labeled MT Tank with residue, was used to estimate the DOT Type for the V-3 tank. The radionuclide activities used in this spreadsheets are from the characterization data provided in *Comprehensive Remedial Investigation/Feasibility Study (RI/FS) for Test Area North Operable Unit 1-10 at INEEL* (DOE/ID-10557, November 1997). The characterization data was converted from picocuries per gram (pCi/g) to curies (Ci). Average sludge sample data values were used when calculating each radionuclide for the Tank V-3 solid or sludge heel. The solid or sludge density was converted from the applicable Tank V-3 analytical data and converted to g/cc.

The total activity for a 17.26-gallon sludge heel remaining in Tank V-3 was then calculated using average activities. The sludge heel is assumed to be uniformly distributed along the 19.5-foot length of tank. The data was then copied into another DOT spreadsheet using the 17.26-gallon volume of waste, weight, and percent of total activity. The amount of waste and percent activity is dependent upon a reasonable assumption that the amount of sludge heel remaining in the tank pipe can be achieved. The 17.26-gallon volume of sludge remaining in the tank, combined with the volume of the tank, is a goal that when using average activity levels. This quantity results in a classification of the Tanks as Class A surface contaminated debris, which can be shipped as LSA II quantity. The actual amount of sludge per tank (that does not exceed a LSA II quantity) will be determined by analysis of the actual waste stream and by plotting a graph of gallons versus LSA II Package unity calculation and then interpolating the number of gallons at 99 percent of the LSA II quantity limit against the actual activity of the sludge heel. IN reality the controlling factor is the total curies of Sr-90 that is determined in the sludge, as that is what is controlling the determination that the waste is a Class A waste. Under the above condition, the waste is Class A, but the addition of any more curies of Sr-90 would result in the Waste being classified as Class B.

Discussion:

Piping:

To determine the respective amount of activity that the sludge represented in a foot of pipe, the total activity in the total sludge or solid phase of Tank V-3 needs to be determined (refer to Attachment 1). The DOT spreadsheet entitled "V-3 All Sludge AVG" analyzes the 652 total gallons of sludge or solid phase waste in Tank V-3. For a 6-inch pipe, with 1/8th inch of contamination or 0.038 gallons, in one foot of pipe would represent 5.8E-03 percent of the total (i.e., 652 gallons) of Tank V-3 sludge or solid phase waste. Therefore,

the individual radionuclide activities for the total Tank V-3 can be multiplied by $5.8\text{E-}05$ to determine the activities that would be present in 0.038 gallon (refer to Attachment 2). These values can then be used to plot a graph of total gallons of sludge versus the sum of the ratios of activities per A_2 for the total amount of sludge in the Tank V-3 and 0.038 gallons. Refer to Table 1.

**Table 1. X and Y values for plotting the graph of total gallons of sludge
in piping versus sum of the A_2 ratios**

Description	Total gallons (x)	Sum of A_2 ratios (y)
Total V-3 Tank sludge	652	35.9
Total V-3 sludge in 1 foot of pipe	0.038	0.00206

Using the graph of the values in Table 1 (see attachment 2), the volume of sludge at 99 percent of the Type A quantity per package is 17.97 gallons. The total linear feet of pipe per package is $(17.97 \text{ gallons}) / (0.038 \text{ gallons/ft.})$ or 472 feet.

Tank:

Using the average sample values the 17.26-gallon volume of sludge heel distributed along the bottom of the tank will not exceed the DOT Type LSA II shipping requirements. Using a specific gravity of 1.25 g/cc, this amount of sludge will weigh approximately 179 lbs.

Conclusions and Recommendations:

Piping:

1. 472 linear feet of 6-inch pipe can be placed into a DOT Type LSA II package and not exceed a Type A quantity per package. Since this quantity is so large the packaging of the pipe will not be an issue, as packaging will contain considerably less pipe
2. With respect to its radioactive constituents only, the pipe meets the definition of a low-level waste.
3. With respect to DOT transportation, the pipe would be a Class 7 Radioactive material.
4. With respect to DOT packaging, the pipe would meet the definition of a low specific activity II (LSA-II solid or UN2912) material and could be placed into excepted packaging (IP-2).
5. The amount of fissile material per package (2.28 grams actual) would be less than 15 g/pkg. and would therefore be considered "fissile excepted."
6. Since the contamination in the pipe will exceed the limits for Class A waste, the pipe will need to be flushed to remove loose contamination and to meet the goal of disposal as a Class A waste.

Tank:

1. The goal for sludge remaining inside the tanks will be less than 17.26 gallons. A quantity < 17.26 gallons of sludge heel will meet the DOT Type LSA II package requirements and not exceed a Type A quantity per tank.
2. With respect to its radioactive constituents only, the tank meets the definition of a low-level waste.
3. With respect to DOT transportation, the tank would be a Class 7 Radioactive material.
4. With respect to DOT packaging, the tank with the 17.26 gallons of sludge heel would meet the definition of a limited quantity or low specific activity II (LSA-II solid) and could not be placed into excepted packaging.
5. The amount of fissile material per package (2.5 grams actual) would be less than 15 g/pkg. and would therefore be considered "fissile excepted."
6. Assuming 10% of the activity inside the tank is removable contamination, the tank would exceed the DOT SCO-II limits for removable contamination and would require Type A packaging.

Computer Source:

Hewlett-Packard Kayak XU800 with Microsoft Window NT, operating system and Office 97 software.

List of Attachments

Attachment	Title
1	DOT Spreadsheet entitled, "V-3 All Sludge AVG"
2	0.25 Inch Sludge per 4" and 6" Pipe per Linear Foot and 0.0625 Inch Sludge per 6" Pipe
3	Tank with 17.26 gal Residue
4	Volume and Weight Calculation for 4 and 6 Inch Pipe
5	Volume and Weight of V-Tanks and Contamination Prior to Removal from Ground

Attachment 1

DOT Spreadsheet entitled, "V-3 All Sludge AVG"

V-3 All Sludge AVG

Section III: Check radionuclides for listing on labels and shipping papers: Check reportable radionuclides per Envirocare WAC

Nuclide	Activity (Ci)	% of Total A2 Fraction	Cumulative A2 Fraction	Nuclide	Activity (Ci)	% of Total Activity	Activity Conc. (pCi/g)	Source Material (kg)	SNM (g)	Activity Conc. (Ci/m ³)
Sr-90	5.44E+01	5.61E+01	5.61E+01	Sr-90	5.44E+01	7.07E+01	1.76E+07	Not applicable	Not applicable	1.44E+00
Pu-238	3.36E-02	1.73E+01	7.34E+01	Cs-137	1.91E+01	2.48E+01	6.20E+06	Not applicable	Not applicable	5.05E-01
Am-241	1.80E-02	9.29E+00	8.27E+01	Ni-63	2.40E+00	3.12E+00	7.79E+05	Not applicable	Not applicable	6.34E-02
Pu-239	1.74E-02	8.95E+00	9.17E+01	Co-60	4.72E-01	6.12E-01	1.53E+05	Not applicable	Not applicable	1.25E-02
Cs-137	1.91E+01	3.95E+00	9.56E+01	Pu-241	1.72E-01	2.23E-01	5.56E+04	Not applicable	1.72E-03	4.53E-03
Pu-241	1.72E-01	1.77E+00	9.74E+01	Eu-154	7.91E-02	1.03E-01	2.56E+04	Not applicable	Not applicable	2.09E-03
Cm-243	5.07E-03	1.74E+00	9.91E+01	Eu-152	4.61E-02	5.98E-02	1.49E+04	Not applicable	Not applicable	1.22E-03
U-233	5.62E-03	5.79E-01	9.97E+01	Ru-103	4.10E-02	5.33E-02	1.33E+04	Not applicable	Not applicable	1.08E-03
Co-60	4.72E-01	1.22E-01	9.98E+01	Ce-144	3.40E-02	4.41E-02	1.10E+04	Not applicable	Not applicable	8.97E-04
Np-237	7.46E-05	3.84E-02	9.99E+01	Pu-238	3.36E-02	4.36E-02	1.09E+04	Not applicable	1.98E-03	8.87E-04
Ra-226	7.34E-03	3.78E-02	9.99E+01	Ru-106	3.35E-02	4.35E-02	1.09E+04	Not applicable	Not applicable	8.85E-04
Ce-144	3.40E-02	1.75E-02	9.99E+01	Am-241	1.80E-02	2.34E-02	5.84E+03	Not applicable	Not applicable	4.78E-04
Ru-106	3.35E-02	1.73E-02	1.00E+02	Pu-239	1.74E-02	2.25E-02	5.62E+03	Not applicable	2.80E-01	4.58E-04
Eu-154	7.91E-02	1.63E-02	1.00E+02	Sb-125	1.35E-02	1.75E-02	4.38E+03	Not applicable	Not applicable	3.57E-04
Ni-63	2.40E+00	8.26E-03	1.00E+02	Eu-155	1.08E-02	1.41E-02	3.51E+03	Not applicable	Not applicable	2.86E-04
Eu-152	4.61E-02	5.28E-03	1.00E+02	Zr-95	9.27E-03	1.20E-02	3.00E+03	Not applicable	Not applicable	2.45E-04
Ru-103	4.10E-02	4.70E-03	1.00E+02	Nb-95	8.04E-03	1.04E-02	2.61E+03	Not applicable	Not applicable	2.12E-04
Sb-125	1.35E-02	1.55E-03	1.00E+02	Ra-226	7.34E-03	9.53E-03	2.38E+03	Not applicable	Not applicable	1.94E-04
Cm-242	1.21E-04	1.25E-03	1.00E+02	U-233	5.62E-03	7.30E-03	1.82E+03	Not applicable	5.79E-01	1.48E-04
Ag-110m	4.28E-03	1.06E-03	1.00E+02	Cm-243	5.07E-03	6.58E-03	1.64E+03	Not applicable	Not applicable	1.34E-04
Zr-95	9.27E-03	1.06E-03	1.00E+02	Ag-110m	4.28E-03	5.58E-03	1.39E+03	Not applicable	Not applicable	1.13E-04
Nb-95	8.04E-03	8.29E-04	1.00E+02	Co-58	4.24E-03	5.50E-03	1.37E+03	Not applicable	Not applicable	1.12E-04
Cs-134	3.82E-03	7.87E-04	1.00E+02	Cs-134	3.82E-03	4.96E-03	1.24E+03	Not applicable	Not applicable	1.01E-04
Eu-155	1.08E-02	5.58E-04	1.00E+02	Zn-65	3.74E-03	4.86E-03	1.21E+03	Not applicable	Not applicable	8.88E-05
Co-58	4.24E-03	4.37E-04	1.00E+02	Ag-108m	2.39E-03	3.11E-03	7.75E+02	Not applicable	Not applicable	6.32E-05
Ag-108m	2.39E-03	4.11E-04	1.00E+02	Mn-54	1.51E-03	1.98E-03	4.89E+02	Not applicable	Not applicable	3.98E-05
Zn-65	3.74E-03	1.93E-04	1.00E+02	U-235	1.83E-04	2.38E-04	5.95E+01	Not applicable	8.34E+01	4.85E-06
Mn-54	1.51E-03	1.55E-04	1.00E+02	I-129	1.77E-04	2.30E-04	5.74E+01	Not applicable	Not applicable	4.68E-06
Th-234	1.71E-04	8.84E-05	1.00E+02	U-238	1.71E-04	2.23E-04	5.58E+01	Not applicable	Not applicable	4.53E-06
Pa-233	7.46E-05	8.54E-06	1.00E+02	Th-234	1.71E-04	2.23E-04	5.56E+01	Not applicable	Not applicable	4.53E-06
U-235	1.83E-04	0.00E+00	1.00E+02	Cm-242	1.21E-04	1.57E-04	3.92E+01	Not applicable	Not applicable	3.19E-06
I-129	1.77E-04	0.00E+00	1.00E+02	Np-237	7.46E-05	9.69E-05	2.42E+01	Not applicable	Not applicable	1.97E-06
U-238	1.71E-04	0.00E+00	1.00E+02	Pa-233	7.46E-05	9.69E-05	2.42E+01	Not applicable	Not applicable	1.97E-06

If #DIV/0! occurs in the Fraction of Waste Profile Column or the Does Nuclide Meet Waste Profile? Column of Section III, the nuclide is not included on the current profile and needs to be added.
Waste Classification Determination for near surface disposal per 10 CFR 61.55

Assume that Sr-90, Cs-137, and Ni-63 are major nuclides driving waste classification determination for Tank V-3 wastes

Table 2 limit (Ci/m³)

Radionucl Column 1 Column 2 V-3 All Sludge AVG

Sr-90	0.04	150	1.44E+00
Cs-137	1	44	5.05E-01
Ni-63	3.5	70	6.34E-02
Class A Sum of Fractions:			14.08
Class B Sum of Fractions:			0.04

Class B Must stabilize using suitable solidification media and meet applicable 10 CFR 61.56 requirements

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Attachment 2

0.25 Inch Sludge per 4" and 6" Pipe per Linear Foot
and 0.0625 Inch Sludge per 6" Pipe

11/7/27

Con. J #.25" V-3 Tank Sludge in one foot of 4-inch pipe

Note: based upon BTP Radioactive Waste Classification (May 1983, Rev.0), the final waste form volume may be used for 10 CFR 61.55 Classification

Section I. Waste Stream Information

Container Type N/A

Description: 0.088 gallons of Sludge

Note: assume solid phase volume of 0.088 gallons with density of 1.25 g/cc

Container Container Container Waste

Gross Wt (lb) Gross Wt (kg) Tare Wt (lb) Tare Wt (kg)

6.33 2.87 5.55 2.52 0.35

Volume of .25" sludge in one foot of 4" pipe is 0.088 gal.

Constants
3.70E+10 Bq/Cl
453.6 g/lb
1.00E-12 fBq/Bq or Cl/pC
1000.00 g/kg
1.00E+09 nCi/Cl

Dose survey from Sxxxx on xx/xx/00 shows < mem/hr OC.

Radioactive liquid effluents from hot cells, labs, and decon facilities at TAN and IETf.

EPA regulated hazardous COCs: Barium, Cadmium, Chromium, Lead, Mercury, Silver, VOCs, S

Section II. List the radionuclides and activities; perform DOT, RAM, RQ, LTD QTY, and Type A Packaging checks

Nuclide	Activity (Ci)	% of Total A2 Fraction	Activity (Bq)	Activity/gram (Bq/gram)	RQ limits (TBq)	RQ Ratios (amount/limit)	A2 Value (TBq)	LTD QTY Det. amount/(10-3)/A2 (amount/A2)	Type A Pkg? DOT Fissile Mass (g)	TRU Conc. (nCi/g)	LSA-II Solids Frac	Activity/gram (pCi/g)
Sr-90	7.35E-03	5.81E+01	2.72E+08	7.68E+05	3.70E-03	7.35E-02	1.00E-01	2.72E+00	2.72E-03	0.00E+00	7.88E-02	2.08E+07
Cs-137	2.58E-03	3.95E+00	9.55E+07	2.70E+05	3.70E-02	2.58E-03	5.00E-01	1.91E-01	1.91E-04	0.00E+00	5.40E-03	7.30E+06
Ni-63	3.24E-04	8.26E-03	1.20E+07	3.39E+04	3.70E+00	3.24E-06	3.00E+01	4.00E-04	4.00E-07	0.00E+00	1.13E-05	9.16E+05
Co-60	6.36E-05	1.22E-01	2.35E+06	6.86E+03	3.70E-01	6.36E-06	4.00E-01	5.89E-03	5.89E-06	0.00E+00	1.66E-04	1.80E+05
Pu-241	2.32E-05	1.77E+00	8.57E+05	2.42E+03	3.70E-02	2.32E-05	1.00E-02	8.57E-02	8.57E-05	0.00E+00	2.42E-03	6.55E+04
Eu-154	1.07E-05	1.63E-02	3.95E+05	1.12E+03	3.70E-01	1.07E-06	5.00E-01	7.90E-04	7.90E-07	0.00E+00	2.23E-05	3.02E+04
Eu-152	6.22E-06	5.28E-03	2.30E+05	5.79E+02	3.70E-01	6.22E-07	9.00E-01	2.56E-04	2.56E-07	0.00E+00	7.22E-06	1.76E+04
Ru-103	5.54E-06	4.70E-03	2.05E+05	5.79E+02	3.70E-01	5.54E-07	9.00E-01	2.28E-04	2.28E-07	0.00E+00	6.44E-06	1.57E+04
Ce-144	4.58E-06	1.75E-02	1.70E+05	4.79E+02	3.70E-02	4.58E-06	2.00E-01	8.48E-04	8.48E-07	0.00E+00	2.40E-05	1.30E+04
Pu-238	4.53E-06	1.73E+01	1.88E+05	4.74E+02	3.70E-04	4.53E-04	2.00E-04	8.39E-01	8.39E-04	1.28E+01	2.37E-02	1.28E+04
Ru-106	4.52E-06	1.73E-02	1.67E+05	4.73E+02	3.70E-02	4.52E-06	2.00E-01	8.37E-04	8.37E-07	0.00E+00	2.36E-05	1.28E+04
Am-241	2.43E-06	9.29E+00	9.00E+04	2.54E+02	3.70E-04	2.43E-04	2.00E-04	4.50E-01	4.50E-04	0.00E+00	1.27E-02	6.88E+03
Pu-239	2.34E-06	8.95E+00	8.66E+04	2.45E+02	3.70E-04	2.34E-04	2.00E-04	4.39E-01	4.39E-04	6.88E+00	1.22E-02	6.82E+03
Sb-125	1.82E-06	1.55E-03	6.74E+04	1.91E+02	3.70E-01	1.82E-07	9.00E-01	7.49E-05	7.49E-08	0.00E+00	2.12E-06	5.15E+03
Eu-155	1.46E-06	5.58E-04	5.41E+04	1.53E+02	3.70E-01	1.46E-07	2.00E+00	2.70E-05	2.70E-08	0.00E+00	7.64E-07	4.13E+03
Zr-95	1.25E-06	1.08E-03	4.63E+04	1.31E+02	3.70E-01	1.25E-07	9.00E-01	5.14E-05	5.14E-08	0.00E+00	1.45E-06	3.54E+03
Nb-95	1.08E-06	8.29E-04	4.01E+04	1.13E+02	3.70E-01	1.08E-07	1.00E+00	4.01E-05	4.01E-08	0.00E+00	1.13E-06	3.07E+03
Ra-226	9.90E-07	3.78E-02	3.66E+04	1.04E+02	3.70E-03	9.90E-06	2.00E-02	1.83E-03	1.83E-06	0.00E+00	5.18E-05	2.80E+03
U-233	7.58E-07	5.79E-01	2.81E+04	7.83E+01	3.70E-03	7.58E-06	1.00E-03	2.81E-02	2.81E-05	0.00E+00	7.93E-04	2.14E+03
Cm-243	6.84E-07	1.74E+00	2.53E+04	7.15E+01	3.70E-04	6.84E-05	3.00E-04	8.43E-02	8.43E-05	1.93E+00	2.38E-03	1.93E+03
Ag-110m	5.78E-07	1.10E-03	2.14E+04	6.04E+01	3.70E-01	5.78E-08	4.00E-01	5.34E-05	5.34E-08	0.00E+00	1.51E-06	1.63E+03
Co-58	5.72E-07	4.37E-04	2.12E+04	5.98E+01	3.70E-01	5.72E-08	1.00E+00	2.12E-05	2.12E-08	0.00E+00	5.98E-07	1.62E+03
Cs-134	5.15E-07	7.87E-04	1.91E+04	5.39E+01	3.70E-02	5.15E-07	5.00E-01	3.81E-05	3.81E-08	0.00E+00	1.08E-06	1.46E+03
Zn-65	5.05E-07	1.93E-04	1.87E+04	5.28E+01	3.70E-01	5.05E-08	2.00E+00	9.34E-06	9.34E-09	0.00E+00	2.64E-07	1.43E+03
Ag-108m	3.23E-07	4.11E-04	1.19E+04	3.38E+01	3.70E-01	3.23E-08	6.00E-01	1.99E-05	1.99E-08	0.00E+00	5.63E-07	9.12E+02
Mn-54	2.03E-07	1.55E-04	7.53E+03	2.13E+01	3.70E-01	2.03E-08	1.00E+00	7.53E-06	7.53E-09	0.00E+00	2.13E-07	5.75E+02
U-235	2.48E-08	0.00E+00	9.16E+02	2.59E+00	3.70E-03	2.48E-07	Unlimited	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.00E+01
I-129	2.39E-08	0.00E+00	8.84E+02	2.50E+00	3.70E-05	2.39E-05	Unlimited	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.75E+01
U-238	2.31E-08	0.00E+00	8.56E+02	2.42E+00	3.70E-03	2.31E-07	Unlimited	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.54E+01
Th-234	2.31E-08	8.84E-05	8.56E+02	2.42E+00	3.70E+00	2.31E-10	2.00E-01	4.28E-09	4.28E-09	0.00E+00	1.21E-07	6.54E+01
Cm-242	1.63E-08	1.25E-03	6.03E+02	1.70E+00	3.70E-02	1.63E-08	1.00E-02	6.03E-05	6.03E-08	0.00E+00	1.70E-06	4.61E+01
Np-237	1.01E-08	3.84E-02	3.72E+02	1.05E+00	3.70E-04	1.01E-06	2.00E-04	1.86E-03	1.86E-06	2.84E-02	5.26E-05	2.84E+01
Pa-233	1.01E-08	8.64E-06	3.72E+02	1.05E+00	3.70E+00	1.01E-10	9.00E-01	4.14E-07	4.14E-10	0.00E+00	1.17E-08	2.84E+01
Total	1.04E-02	100.00%	3.84E+08	1.09E+06		7.71E-02		4.84E+00	4.84E-03	2.83E+01	1.37E-01	2.94E+07

DOT regulated as Hazard Class 7 Radioactive Material

NOT an RQ amount of a Hazardous Substance

< Type A quantity/package per 49 CFR 173.431(a); check if excepted quantity -> excepted packaging

Does NOT meet LTD QTY Exception; Check if LSA

Date:

Performed by:

Meets Low Specific Activity (LSA)-II material - Check <Type A quantity and use Radioactive material, LSA, n.o.s. as PSN
Meets criteria for Fissile Excepted Package per 49 CFR 173.453
This is a Low-level waste

Reviewed by: _____ Date: _____

Section III: Check radionuclides for listing on labels and shipping papers; Check reportable radionuclides per Envirocare WAC

Nuclide	Activity (Ci)	% of Total A2 Fraction	Nuclide	Activity (Ci)	% of Total Activity	Activity Conc. (pCi/g)	Source Material (kg)	SNM (g)	Activity Conc. (Ci/m ³)
Sr-90	7.35E-03	5.61E+01	Sr-90	7.35E-03	7.07E+01	2.08E+07	Not applicable	Not applicable	2.98E+00
Pu-238	2.58E-03	1.73E+01	Cs-137	2.58E-03	2.48E+01	7.30E+06	Not applicable	Not applicable	1.05E+00
Am-241	3.24E-04	9.29E+00	Ni-63	3.24E-04	3.12E+00	9.16E+05	Not applicable	Not applicable	1.31E-01
Pu-239	6.36E-05	8.95E+00	Co-60	6.36E-05	6.12E-01	1.80E+05	Not applicable	Not applicable	2.58E-02
Cs-137	2.32E-05	3.95E+00	Pu-241	2.32E-05	2.23E-01	6.55E+04	Not applicable	2.32E-07	9.38E-03
Pu-241	1.07E-05	1.77E+00	Eu-154	1.07E-05	1.03E-01	3.02E+04	Not applicable	Not applicable	4.32E-03
Cm-243	6.22E-06	1.74E+00	Eu-152	6.22E-06	5.98E-02	1.76E+04	Not applicable	Not applicable	2.52E-03
U-233	5.54E-06	5.79E-01	Ru-103	5.54E-06	5.33E-02	1.57E+04	Not applicable	Not applicable	2.24E-03
Co-60	4.58E-06	1.22E-01	Ce-144	4.58E-06	4.41E-02	1.30E+04	Not applicable	Not applicable	1.86E-03
Np-237	4.53E-06	3.84E-02	Pu-238	4.53E-06	4.36E-02	1.28E+04	Not applicable	2.67E-07	1.84E-03
Ra-226	4.52E-06	3.78E-02	Ru-106	4.52E-06	4.35E-02	1.28E+04	Not applicable	Not applicable	1.83E-03
Ce-144	2.43E-06	1.75E-02	Am-241	2.43E-06	2.34E-02	6.88E+03	Not applicable	Not applicable	9.85E-04
Ru-106	2.34E-06	1.73E-02	Pu-239	2.34E-06	2.25E-02	6.62E+03	Not applicable	3.78E-05	9.48E-04
Eu-154	1.82E-06	1.63E-02	Sb-125	1.82E-06	1.75E-02	5.15E+03	Not applicable	Not applicable	7.38E-04
Ni-63	1.46E-06	8.26E-03	Eu-155	1.46E-06	1.41E-02	4.13E+03	Not applicable	Not applicable	5.92E-04
Eu-152	1.25E-06	5.28E-03	Zr-95	1.25E-06	1.20E-02	3.54E+03	Not applicable	Not applicable	5.07E-04
Ru-103	1.08E-06	4.70E-03	Nb-95	1.08E-06	1.04E-02	3.07E+03	Not applicable	Not applicable	4.39E-04
Sb-125	9.90E-07	1.55E-03	Ra-226	9.90E-07	9.53E-03	2.80E+03	Not applicable	Not applicable	4.01E-04
Cm-242	7.58E-07	1.25E-03	U-233	7.58E-07	7.30E-03	2.14E+03	Not applicable	7.82E-05	3.07E-04
Ag-110m	6.84E-07	1.10E-03	Cm-243	6.84E-07	6.58E-03	1.93E+03	Not applicable	Not applicable	2.77E-04
Zr-95	5.78E-07	1.06E-03	Ag-110m	5.78E-07	5.56E-03	1.63E+03	Not applicable	Not applicable	2.34E-04
Nb-95	5.72E-07	8.29E-04	Co-58	5.72E-07	5.50E-03	1.62E+03	Not applicable	Not applicable	2.32E-04
Cs-134	5.15E-07	7.87E-04	Cs-134	5.15E-07	4.96E-03	1.46E+03	Not applicable	Not applicable	2.09E-04
Eu-155	5.05E-07	5.58E-04	Zn-65	5.05E-07	4.88E-03	1.43E+03	Not applicable	Not applicable	2.05E-04
Co-58	3.23E-07	4.37E-04	Ag-108m	3.23E-07	3.11E-03	9.12E+02	Not applicable	Not applicable	1.31E-04
Ag-108m	2.03E-07	4.11E-04	Mn-54	2.03E-07	1.96E-03	5.75E+02	Not applicable	Not applicable	8.24E-05
Zn-65	2.48E-08	1.93E-04	U-235	2.48E-08	2.38E-04	7.00E+01	Not applicable	1.13E-02	1.00E-05
Mn-54	2.39E-08	1.55E-04	I-129	2.39E-08	2.30E-04	6.75E+01	Not applicable	Not applicable	9.68E-06
Th-234	2.31E-08	8.84E-05	U-238	2.31E-08	2.23E-04	6.54E+01	Not applicable	Not applicable	9.37E-06
Pa-233	2.31E-08	8.54E-06	Th-234	2.31E-08	2.23E-04	6.54E+01	Not applicable	Not applicable	9.37E-06
U-235	1.63E-08	0.00E+00	Cm-242	1.63E-08	1.57E-04	4.61E+01	Not applicable	Not applicable	6.60E-06
I-129	1.01E-08	0.00E+00	Np-237	1.01E-08	9.69E-05	2.84E+01	Not applicable	Not applicable	4.08E-06
U-238	1.01E-08	0.00E+00	Pa-233	1.01E-08	9.69E-05	2.84E+01	Not applicable	Not applicable	4.08E-06

If #DIV/0! occurs in the Fraction of Waste Profile Column or the Does Nuclide Meet Waste Profile? Column of Section III, the nuclide is not included on the current profile and needs to be added.

Waste Classification Determination for near surface disposal per 10 CFR §61.55

Assume that Sr-90, Cs-137, and Ni-63 are major nuclides driving waste classification determination for Tank V-1, V-2, and V-3 wastes

Table 2 limit (Ci/m³)

Radionuclide Column 1 Column 2 .25" V-3 Sludge in a 6" pipe

Sr-90	0.04	150	2.98E+00
Cs-137	1	44	9.38E-03
Ni-63	3.5	70	5.92E-04

Class A Sum of Fractions: 74.39
Class B Sum of Fractions: 0.02

Class B

Container ID # 25" V-3 Tank Sludge in one foot of 6-inch pipe

Note: based upon BTP Radioactive Waste Classification (May 1983, Rev.0), the final waste form volume may be used for 10 CFR 61.55 Classification

Section I. Waste Stream Information

Container Type N/A

Description: 0.15 gallons of Sludge

Note: assume solid phase volume of 0.12 gallons with density of 1.25 g/cc

Container	Container	Container	Waste	Est. Waste Vol.	Final Waste Vol.
Gross Wt (lb)	Gross Wt (kg)	Tare Wt (lb)	Net Wt (kg)	(m3)	(m3)
9.52	4.32	8.27	3.75	0.57	5.68E-04

Volume of .25" sludge in one foot of 6" pipe is 0.15 gal.

Dose survey from Sxxxxx on xx/xx/00 shows < mrem/hr OC.

Radioactive liquid effluents from hot cells, labs, and decon facilities at TAN and IETF.

EPA regulated hazardous COCs: Barium, Cadmium, Chromium, Lead, Mercury, Silver, VOCs, S'

Section II. List the radionuclides and activities; perform DOT RAM, RQ, LTD QTY, and Type A Packaging checks

Nuclide	Activity (Ci)	% of Total A2 Fraction	Activity (Bq)	Activity (Bq/gram)	RQ limits (TBq)	RQ Ratios (amount/limit)	A2 Value (TBq)	LTD QTY Det. amount/(10-3)A2 (g)	Type A Pkg? DOT Fissile Mass (amount/A2)	TRU Conc. (nC/g)	LSA-II Solids Frac	Activity/gram (pCi/g)
Sr-90	1.25E-02	5.61E+01	4.63E+08	8.17E+05	3.70E-03	1.25E-01	1.00E-01	4.63E+00	4.63E-03	0.00E+00	8.17E-02	2.21E+07
Cs-137	4.40E-03	3.95E+00	1.63E+08	2.87E+05	3.70E-02	4.40E-03	5.00E-01	3.26E-01	3.26E-04	0.00E+00	5.74E-03	7.76E+06
Ni-63	5.53E-04	8.26E-03	2.04E+07	3.61E+04	3.70E+00	5.53E-06	3.00E+01	6.82E-04	6.82E-07	0.00E+00	1.20E-05	9.75E+05
Co-60	1.08E-04	1.22E-01	4.01E+06	7.08E+03	3.70E-01	1.08E-05	4.00E-01	1.00E-02	1.00E-05	0.00E+00	1.77E-04	1.91E+05
Pu-241	3.95E-05	1.77E+00	1.46E+06	2.58E+03	3.70E-02	3.95E-05	1.00E-02	1.46E-01	1.46E-04	0.00E+00	2.58E-03	6.96E+04
Eu-154	1.82E-05	1.63E-02	6.73E+05	1.19E+03	3.70E-01	1.82E-06	5.00E-01	1.35E-03	1.35E-06	0.00E+00	2.37E-05	3.21E+04
Eu-152	1.06E-05	5.28E-03	3.92E+05	6.91E+02	3.70E-01	1.06E-06	9.00E-01	4.36E-04	4.36E-07	0.00E+00	7.68E-06	1.87E+04
Ru-103	9.44E-06	4.70E-03	3.49E+05	6.16E+02	3.70E-01	9.44E-07	9.00E-01	3.88E-04	3.88E-07	0.00E+00	6.84E-06	1.66E+04
Ce-144	7.81E-06	1.75E-02	2.89E+05	5.10E+02	3.70E-02	7.81E-06	2.00E-01	1.45E-03	1.45E-06	0.00E+00	2.55E-05	1.38E+04
Pu-238	7.73E-06	1.73E-01	2.85E+05	5.04E+02	3.70E-04	7.73E-06	2.00E-01	1.43E-03	1.43E-06	0.00E+00	2.52E-02	1.36E+04
Ru-106	7.71E-06	1.73E-02	2.85E+05	5.03E+02	3.70E-02	7.71E-06	2.00E-01	1.43E-03	1.43E-06	0.00E+00	2.51E-05	1.36E+04
Am-241	4.15E-06	9.29E+00	1.53E+05	2.71E+02	3.70E-04	4.15E-04	2.00E-04	7.67E-01	7.67E-04	0.00E+00	1.35E-02	7.31E+03
Pu-239	3.99E-06	8.95E+00	1.48E+05	2.60E+02	3.70E-04	3.99E-04	2.00E-04	7.38E-01	7.38E-04	0.00E+00	1.30E-02	7.04E+03
Sb-125	3.11E-06	1.55E-03	1.15E+05	2.03E+02	3.70E-01	3.11E-07	9.00E-01	1.28E-04	1.28E-07	0.00E+00	2.25E-06	5.48E+03
Eu-155	2.49E-06	5.58E-04	9.22E+04	1.63E+02	3.70E-01	2.49E-07	2.00E+00	4.61E-05	4.61E-08	0.00E+00	8.13E-07	4.39E+03
Zr-95	2.13E-06	1.06E-03	7.89E+04	1.39E+02	3.70E-01	2.13E-07	9.00E-01	8.77E-05	8.77E-08	0.00E+00	1.55E-06	3.76E+03
Nb-95	1.85E-06	8.29E-04	6.84E+04	1.21E+02	3.70E-01	1.85E-07	1.00E+00	6.84E-05	6.84E-08	0.00E+00	1.21E-06	3.26E+03
Ra-226	1.69E-06	3.78E-02	6.25E+04	1.10E+02	3.70E-03	1.69E-05	2.00E-02	3.12E-03	3.12E-06	0.00E+00	5.51E-05	2.98E+03
U-233	1.29E-06	5.79E-01	4.78E+04	8.44E+01	3.70E-03	1.29E-05	1.00E-03	4.78E-02	4.78E-05	0.00E+00	8.44E-04	2.28E+03
Cm-243	1.17E-06	1.74E+00	4.31E+04	7.60E+01	3.70E-04	1.17E-04	3.00E-04	1.44E-01	1.44E-04	0.00E+00	2.53E-03	2.06E+03
Ag-110m	9.85E-07	1.10E-03	3.64E+04	6.43E+01	3.70E-01	9.85E-08	4.00E-01	9.11E-05	9.11E-08	0.00E+00	1.61E-06	1.74E+03
Cs-134	9.75E-07	4.37E-04	3.61E+04	6.36E+01	3.70E-01	9.75E-08	1.00E+00	6.50E-05	6.50E-08	0.00E+00	6.36E-07	1.72E+03
Co-58	8.78E-07	7.87E-04	3.25E+04	5.73E+01	3.70E-02	8.78E-07	5.00E-01	6.50E-05	1.59E-08	0.00E+00	1.15E-06	1.55E+03
Zn-65	8.61E-07	1.93E-04	3.18E+04	5.62E+01	3.70E-01	8.61E-08	2.00E+00	1.59E-05	3.39E-08	0.00E+00	2.81E-07	1.52E+03
Ag-108m	5.50E-07	4.11E-04	2.04E+04	3.59E+01	3.70E-01	5.50E-08	6.00E-01	3.39E-05	3.39E-08	0.00E+00	5.98E-07	9.70E+02
Mn-54	3.47E-07	1.55E-04	1.28E+04	2.26E+01	3.70E-01	3.47E-08	1.00E+00	1.28E-05	1.28E-08	0.00E+00	2.26E-07	6.12E+02
U-235	4.22E-08	0.00E+00	1.56E+03	2.75E+00	3.70E-03	4.22E-07	Unlimited	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.44E+01
I-129	4.07E-08	0.00E+00	1.51E+03	2.66E+00	3.70E-05	4.07E-05	Unlimited	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.18E+01
Th-238	3.95E-08	8.84E-05	1.46E+03	2.57E+00	3.70E-03	3.95E-10	2.00E-01	7.30E-06	7.30E-09	0.00E+00	1.29E-07	6.96E+01
Cm-242	2.78E-08	1.25E-03	1.03E+03	1.81E+00	3.70E-02	2.78E-08	1.00E-02	1.03E-04	1.03E-07	0.00E+00	1.81E-06	4.90E+01
Np-237	1.72E-08	3.84E-02	6.35E+02	1.12E+00	3.70E-04	1.72E-06	2.00E-04	3.17E-03	3.17E-06	0.00E+00	5.60E-05	3.03E+01
Pa-233	1.72E-08	8.54E-06	6.35E+02	1.12E+00	3.70E+00	1.72E-10	9.00E-01	7.05E-07	7.05E-10	0.00E+00	1.24E-08	3.03E+01
Total	1.77E-02	100.00%	6.55E+08	1.16E+06		1.31E-01		8.25E+00	8.25E-03	3.01E+01	1.46E-01	3.12E+07

DOT regulated as Hazard Class 7 Radioactive Material

NOT an RQ amount of a Hazardous Substance

< Type A quantity/package per 49 CFR 173.431(a); check if excepted quantity -> excepted packaging

Does NOT meet LTD QTY Exception; Check if LSA

Date:

Performed by:

.25" sludge per 6" pipe

Meets Low Specific Activity (LSA)-II material - Check <Type A quantity and use Radioactive material, LSA, n.o.s as PSN
Meets criteria for Fissile Excepted Package per 49 CFR 173.453
This is a Low-level waste

Reviewed by: _____ Date: _____

Section III: Check radionuclides for listing on labels and shipping papers; Check reportable radionuclides per Envirocare WAC

Nuclide	Activity (Ci)	% of Total A2 Fraction	Cumulative A2 Fraction	Nuclide	Activity (Ci)	% of Total Activity	Activity Conc. (pCi/g)	Source Material (kg)	SNM (g)	Activity Conc. (Ci/m ³)
Sr-90	1.25E-02	5.61E+01	5.61E+01	Sr-90	1.25E-02	7.07E+01	2.21E+07	Not applicable	Not applicable	2.26E+00
Pu-238	4.40E-03	1.73E+01	7.34E+01	Cs-137	4.40E-03	2.48E+01	7.76E+06	Not applicable	Not applicable	7.93E-01
Am-241	5.53E-04	9.29E+00	8.27E+01	Ni-63	5.53E-04	3.12E+00	9.75E+05	Not applicable	Not applicable	9.96E-02
Pu-239	1.08E-04	8.95E+00	9.17E+01	Co-60	1.08E-04	6.12E-01	1.91E+05	Not applicable	Not applicable	1.95E-02
Cs-137	3.95E-05	3.95E+00	9.56E+01	Pu-241	3.95E-05	2.23E-01	6.96E+04	Not applicable	3.95E-07	7.11E-03
Pu-241	1.82E-05	1.77E+00	9.74E+01	Eu-154	1.82E-05	1.03E-01	3.21E+04	Not applicable	Not applicable	3.28E-03
Cm-243	1.06E-05	1.74E+00	9.91E+01	Eu-152	1.06E-05	5.98E-02	1.87E+04	Not applicable	Not applicable	1.91E-03
U-233	9.44E-06	5.79E-01	9.97E+01	Ru-103	9.44E-06	5.33E-02	1.66E+04	Not applicable	Not applicable	1.70E-03
Co-60	7.81E-06	1.22E-01	9.98E+01	Ce-144	7.81E-06	4.41E-02	1.38E+04	Not applicable	Not applicable	1.41E-03
Np-237	7.73E-06	3.84E-02	9.99E+01	Pu-238	7.73E-06	4.36E-02	1.36E+04	Not applicable	4.54E-07	1.39E-03
Ra-226	7.71E-06	3.78E-02	9.99E+01	Ru-106	7.71E-06	4.35E-02	1.36E+04	Not applicable	Not applicable	1.39E-03
Ce-144	4.15E-06	1.75E-02	9.99E+01	Am-241	4.15E-06	2.34E-02	7.31E+03	Not applicable	Not applicable	7.47E-04
Ru-106	3.99E-06	1.73E-02	1.00E+02	Pu-239	3.99E-06	2.25E-02	7.04E+03	Not applicable	6.44E-05	7.19E-04
Eu-154	3.11E-06	1.63E-02	1.00E+02	Sb-125	3.11E-06	1.75E-02	5.48E+03	Not applicable	Not applicable	5.60E-04
Ni-63	2.49E-06	8.26E-03	1.00E+02	Eu-155	2.49E-06	1.41E-02	4.39E+03	Not applicable	Not applicable	4.49E-04
Eu-152	2.13E-06	5.28E-03	1.00E+02	Zr-95	2.13E-06	1.20E-02	3.76E+03	Not applicable	Not applicable	3.84E-04
Ru-103	1.85E-06	4.70E-03	1.00E+02	Nb-95	1.85E-06	1.04E-02	3.26E+03	Not applicable	Not applicable	3.33E-04
Sb-125	1.69E-06	1.55E-03	1.00E+02	Ra-226	1.69E-06	9.53E-03	2.98E+03	Not applicable	Not applicable	3.04E-04
Cm-242	1.29E-06	1.25E-03	1.00E+02	U-233	1.29E-06	7.30E-03	2.28E+03	Not applicable	1.33E-04	2.33E-04
Ag-110m	1.17E-06	1.10E-03	1.00E+02	Cm-243	1.17E-06	6.58E-03	2.06E+03	Not applicable	Not applicable	2.10E-04
Zr-95	9.85E-07	1.06E-03	1.00E+02	Ag-110m	9.85E-07	5.56E-03	1.74E+03	Not applicable	Not applicable	1.77E-04
Nb-95	9.75E-07	8.29E-04	1.00E+02	Co-58	9.75E-07	5.50E-03	1.72E+03	Not applicable	Not applicable	1.76E-04
Cs-134	8.78E-07	7.87E-04	1.00E+02	Cs-134	8.78E-07	4.96E-03	1.55E+03	Not applicable	Not applicable	1.58E-04
Eu-155	8.61E-07	5.58E-04	1.00E+02	Zn-65	8.61E-07	4.86E-03	1.52E+03	Not applicable	Not applicable	1.55E-04
Co-58	5.50E-07	4.37E-04	1.00E+02	Ag-108m	5.50E-07	3.11E-03	9.70E+02	Not applicable	Not applicable	9.91E-05
Ag-108m	3.47E-07	4.11E-04	1.00E+02	Mn-54	3.47E-07	1.96E-03	6.12E+02	Not applicable	Not applicable	6.25E-05
Zn-65	4.22E-08	1.93E-04	1.00E+02	U-235	4.22E-08	2.38E-04	7.44E+01	Not applicable	1.92E-02	7.61E-06
Mn-54	4.07E-08	1.55E-04	1.00E+02	I-129	4.07E-08	2.30E-04	7.18E+01	Not applicable	Not applicable	7.34E-06
Th-234	3.95E-08	8.84E-05	1.00E+02	U-238	3.95E-08	2.23E-04	6.96E+01	Not applicable	Not applicable	7.11E-06
Pa-233	3.95E-08	8.54E-06	1.00E+02	Th-234	3.95E-08	2.23E-04	6.96E+01	Not applicable	Not applicable	7.11E-06
U-235	2.78E-08	0.00E+00	1.00E+02	Cm-242	2.78E-08	1.57E-04	4.90E+01	Not applicable	Not applicable	5.01E-06
I-129	1.72E-08	0.00E+00	1.00E+02	Np-237	1.72E-08	9.69E-05	3.03E+01	Not applicable	Not applicable	3.09E-06
U-238	1.72E-08	0.00E+00	1.00E+02	Pa-233	1.72E-08	9.69E-05	3.03E+01	Not applicable	Not applicable	3.09E-06

If #DIV/0! occurs in the Fraction of Waste Profile Column or the Does Nuclide Meet Waste Profile? Column of Section III, the nuclide is not included on the current profile and needs to be added.
Waste Classification Determination for near surface disposal per 10 CFR 161.55

Assume that Sr-90, Cs-137, and Ni-63 are major nuclides driving waste classification determination for Tank V-1, V-2, and V-3 wastes

Table 2 limit (Ci/m³)
Radionuclide Column 1 Column 2 .25" V-3 Sludge in a 6" pipe

Sr-90	0.04	150	2.26E+00
Cs-137	1	44	7.11E-03
Ni-63	3.5	70	4.49E-04
Class A Sum of Fractions:			56.41
Class B Sum of Fractions:			0.02
Class B			

15/27

Cont. 0.0625" V-3 Tank Sludge in one foot of 6-inch pipe
 Note: based upon BTP Radioactive Waste Classification (May 1983, Rev.0), the final waste form volume may be used for 10 CFR 61.55 Classification

Section I. Waste Stream Information

Container Type: N/A
 Description: 0.038 gallons of Sludge
 Note: assume solid phase volume of 0.038 gallons with density of 1.25 g/cc
 Container Gross Wt (lb) 9.52 Container Gross Wt (kg) 4.32 Container Tare Wt (lb) 8.27 Container Tare Wt (kg) 3.75 Container Waste Vol. (m3) 5.68E-04 Container Waste Vol. (m3) 5.55E-03

Volume of 0.0625" sludge in one foot of 6" pipe is 0.038 gal.

Dose survey from Sxxxx on xx/xx/00 shows < [] mrem/hr OC.

Radioactive liquid effluents from hot cells, labs, and decon facilities at TAN and IETF.

EPA regulated hazardous COCs: Barium, Cadmium, Chromium, Lead, Mercury, Silver, VOCs, S'

Section II. List the radionuclides and activities; perform DOT RQ, LTD QTY, and Type A Packaging checks

Nuclide	Activity (Ci)	% of Total A2 Fraction	Activity (Bq)	Activity (Bq/gram)	RQ limits (TBq)	RQ Ratios (amount/limit)	A2 Value (TBq)	LTD QTY Del. amount/(10-3)A2	Type A Pkg? DOT Fissile Mass (g)	TRU Conc. (nCi/g)	LSA-II Solids Frac	Activity/gram (pCi/g)
Sr-90	3.13E-03	5.61E+01	1.16E+08	8.17E+05	3.70E-03	3.13E-02	1.00E-01	1.16E+00	1.16E-03	0.00E+00	8.17E-02	2.21E+07
Cs-137	1.10E-03	3.95E+00	4.07E+07	2.87E+05	3.70E-02	1.10E-03	5.00E-01	8.14E-02	8.14E-05	0.00E+00	5.74E-03	7.76E+06
Ni-63	1.39E-04	8.26E-03	5.11E+06	3.61E+04	3.70E+00	1.38E-06	3.00E+01	1.70E-04	1.70E-07	0.00E+00	1.20E-05	9.75E+05
Co-60	2.71E-05	1.22E-01	1.00E+06	7.08E+03	3.70E-01	2.71E-06	4.00E-01	2.51E-03	2.51E-06	0.00E+00	1.77E-04	1.91E+05
Pu-241	9.87E-06	1.77E+00	3.65E+05	2.58E+03	3.70E-02	9.87E-06	1.00E-02	3.65E-02	3.65E-05	0.00E+00	2.58E-03	6.98E+04
Eu-154	4.55E-06	1.63E-02	1.68E+05	1.19E+03	3.70E-01	4.55E-07	5.00E-01	3.37E-04	3.37E-07	0.00E+00	2.37E-05	3.21E+04
Eu-152	2.65E-06	5.28E-03	9.80E+04	6.91E+02	3.70E-01	2.65E-07	9.00E-01	1.09E-04	1.09E-07	0.00E+00	7.68E-06	1.87E+04
Ru-103	2.39E-06	4.70E-03	8.73E+04	6.16E+02	3.70E-01	2.38E-07	9.00E-01	9.70E-05	9.70E-08	0.00E+00	6.84E-06	1.66E+04
Ce-144	1.95E-06	1.75E-02	7.23E+04	5.10E+02	3.70E-02	1.95E-06	2.00E-01	3.61E-04	3.61E-07	0.00E+00	2.55E-05	1.38E+04
Pu-238	1.93E-06	1.73E-01	7.15E+04	5.04E+02	3.70E-04	1.93E-04	2.00E-04	3.57E-01	3.57E-04	1.14E-07	2.52E-02	1.36E+04
Ru-106	1.93E-06	1.73E-02	7.13E+04	5.03E+02	3.70E-02	1.93E-06	2.00E-01	3.66E-04	3.66E-07	0.00E+00	2.51E-05	1.36E+04
Am-241	1.04E-06	9.29E+00	3.84E+04	2.71E+02	3.70E-04	1.04E-04	2.00E-04	1.92E-01	1.92E-04	0.00E+00	1.35E-02	7.31E+03
Pu-239	9.98E-07	8.95E+00	3.69E+04	2.60E+02	3.70E-04	9.98E-05	2.00E-04	1.85E-01	1.85E-04	1.61E-05	1.30E-02	7.04E+03
Sb-125	7.76E-07	1.55E-03	2.87E+04	2.03E+02	3.70E-01	7.76E-08	9.00E-01	3.19E-05	3.19E-08	0.00E+00	2.25E-06	5.48E+03
Eu-155	6.23E-07	5.58E-04	2.30E+04	1.63E+02	3.70E-01	6.23E-08	2.00E+00	1.15E-05	1.15E-08	0.00E+00	8.13E-07	4.39E+03
Zr-95	5.33E-07	1.06E-03	1.97E+04	1.39E+02	3.70E-01	5.33E-08	9.00E-01	2.19E-05	2.19E-08	0.00E+00	1.55E-06	3.76E+03
Nb-95	4.62E-07	8.29E-04	1.71E+04	1.21E+02	3.70E-01	4.62E-08	1.00E+00	1.71E-05	1.71E-08	0.00E+00	1.21E-06	3.26E+03
Ra-226	4.22E-07	3.78E-02	1.56E+04	1.10E+02	3.70E-03	4.22E-06	2.00E-02	7.81E-04	7.81E-07	0.00E+00	5.51E-05	2.98E+03
U-233	3.23E-07	5.79E-01	1.20E+04	8.44E+01	3.70E-03	3.23E-06	1.00E-03	1.20E-02	1.20E-05	0.00E+00	8.44E-04	2.28E+03
Cm-243	2.91E-07	1.74E+00	1.08E+04	7.60E+01	3.70E-04	2.91E-05	3.00E-04	3.59E-02	3.59E-05	0.00E+00	2.53E-03	2.06E+03
Ag-110m	2.46E-07	1.10E-03	9.11E+03	6.43E+01	3.70E-01	2.46E-08	4.00E-01	2.28E-05	2.28E-08	0.00E+00	1.61E-06	1.74E+03
Co-58	2.44E-07	4.37E-04	9.02E+03	6.36E+01	3.70E-01	2.44E-08	1.00E+00	9.02E-06	9.02E-09	0.00E+00	6.36E-07	1.72E+03
Cs-134	2.19E-07	7.87E-04	8.12E+03	5.73E+01	3.70E-02	2.19E-07	5.00E-01	1.62E-05	1.62E-08	0.00E+00	1.15E-06	1.55E+03
Zn-65	2.15E-07	1.93E-04	7.96E+03	5.62E+01	3.70E-01	2.15E-08	2.00E+00	3.98E-06	3.98E-09	0.00E+00	2.81E-07	1.52E+03
Ag-108m	1.38E-07	4.11E-04	5.09E+03	3.59E+01	3.70E-01	1.38E-08	6.00E-01	8.48E-06	8.48E-09	0.00E+00	5.98E-07	9.70E+02
Mn-54	8.67E-08	1.55E-04	3.21E+03	2.26E+01	3.70E-01	8.67E-09	1.00E+00	3.21E-06	3.21E-09	0.00E+00	2.26E-07	6.12E+02
U-235	1.06E-08	0.00E+00	3.90E+02	2.75E+00	3.70E-03	1.06E-07	Unlimited	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
I-129	1.02E-08	0.00E+00	3.77E+02	2.66E+00	3.70E-05	1.02E-05	Unlimited	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
U-238	9.86E-09	0.00E+00	3.65E+02	2.57E+00	3.70E-03	9.86E-08	Unlimited	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Th-234	9.86E-09	8.84E-05	3.65E+02	2.57E+00	3.70E+00	9.86E-11	2.00E-01	1.82E-06	1.82E-09	0.00E+00	1.29E-07	6.96E+01
Cm-242	6.95E-09	1.25E-03	2.57E+02	1.81E+00	3.70E-02	6.95E-09	1.00E-02	2.57E-05	2.57E-08	0.00E+00	1.81E-06	4.90E+01
Np-237	4.29E-09	3.84E-02	1.59E+02	1.12E+00	3.70E-04	4.29E-07	2.00E-04	7.93E-04	7.93E-07	0.00E+00	5.60E-05	3.03E+01
Pa-233	4.29E-09	8.54E-06	1.59E+02	1.12E+00	3.70E+00	4.29E-11	9.00E-01	1.76E-07	1.76E-10	0.00E+00	1.24E-08	3.03E+01
Total	4.43E-03	100.00%	1.64E+08	1.16E+06		3.29E-02		2.06E+00	2.06E-03	3.01E+01	1.46E-01	3.12E+07

DOT regulated as Hazard Class 7 Radioactive Material

NOT an RQ amount of a Hazardous Substance

< Type A quantity/package per 49 CFR 173.431(a); check if excepted quantity -> excepted packaging

Does NOT meet LTD QTY Exception; Check if LSA

Performed by:

Date:

.0625" sludge per 6" pipe

Meets Low Specific Activity (LSA)-II material - Check <Type A quantity and use Radioactive material, LSA, n.o.s. as PSN
Meets criteria for Fissile Excepted Package per 49 CFR 173.453
This is a Low-level waste

Date: _____

Reviewed by: _____

Section III: Check radionuclides for listing on labels and shipping papers; Check reportable radionuclides per Envirocare WAC

Nuclide	Activity (Ci)	% of Total A2 Fraction	Cumulative A2 Fraction	Nuclide	Activity (Ci)	% of Total Activity	Activity Conc. (pCi/g)	Source Material	SNM (g)	Activity Conc. (Ci/m ³)
Sr-90	3.13E-03	5.61E+01	5.61E+01	Sr-90	3.13E-03	7.07E+01	2.21E+07	Not applicable	Not applicable	5.64E-01
Pu-238	1.10E-03	1.73E+01	7.34E+01	Cs-137	1.10E-03	2.48E+01	7.76E+06	Not applicable	Not applicable	1.98E-01
Am-241	1.38E-04	9.29E+00	8.27E+01	Ni-63	1.38E-04	3.12E+00	9.75E+05	Not applicable	Not applicable	2.49E-02
Pu-239	2.71E-05	8.95E+00	9.17E+01	Co-60	2.71E-05	6.12E-01	1.91E+05	Not applicable	Not applicable	4.89E-03
Cs-137	9.87E-06	3.95E+00	9.56E+01	Pu-241	9.87E-06	2.23E-01	6.98E+04	Not applicable	9.87E-08	1.78E-03
Pu-241	4.55E-06	1.77E+00	9.74E+01	Eu-154	4.55E-06	1.03E-01	3.21E+04	Not applicable	Not applicable	8.20E-04
Cm-243	2.65E-06	1.74E+00	9.91E+01	Eu-152	2.65E-06	5.98E-02	1.87E+04	Not applicable	Not applicable	4.77E-04
U-233	2.36E-06	5.79E-01	9.97E+01	Ru-103	2.36E-06	5.33E-02	1.66E+04	Not applicable	Not applicable	4.25E-04
Co-60	1.95E-06	1.22E-01	9.98E+01	Ce-144	1.95E-06	4.41E-02	1.38E+04	Not applicable	Not applicable	3.52E-04
Np-237	1.93E-06	3.84E-02	9.99E+01	Pu-238	1.93E-06	4.36E-02	1.36E+04	Not applicable	1.14E-07	3.48E-04
Ra-226	1.93E-06	3.78E-02	9.99E+01	Ru-106	1.93E-06	4.35E-02	1.36E+04	Not applicable	Not applicable	3.47E-04
Ce-144	1.04E-06	1.75E-02	9.99E+01	Am-241	1.04E-06	2.34E-02	7.31E+03	Not applicable	Not applicable	1.87E-04
Ru-106	9.98E-07	1.73E-02	1.00E+02	Pu-239	9.98E-07	2.25E-02	7.04E+03	Not applicable	1.61E-05	1.80E-04
Eu-154	7.76E-07	1.63E-02	1.00E+02	Sb-125	7.76E-07	1.75E-02	5.48E+03	Not applicable	Not applicable	1.40E-04
Ni-63	6.23E-07	8.26E-03	1.00E+02	Eu-155	6.23E-07	1.41E-02	4.39E+03	Not applicable	Not applicable	1.12E-04
Eu-152	5.33E-07	5.28E-03	1.00E+02	Zr-95	5.33E-07	1.20E-02	3.76E+03	Not applicable	Not applicable	9.61E-05
Ru-103	4.62E-07	4.70E-03	1.00E+02	Nb-95	4.62E-07	1.04E-02	3.26E+03	Not applicable	Not applicable	8.33E-05
Sb-125	4.22E-07	1.55E-03	1.00E+02	Ra-226	4.22E-07	9.53E-03	2.98E+03	Not applicable	Not applicable	7.60E-05
Cm-242	3.23E-07	1.25E-03	1.00E+02	U-233	3.23E-07	7.30E-03	2.28E+03	Not applicable	3.35E-05	5.82E-05
Ag-110m	2.91E-07	1.10E-03	1.00E+02	Cm-243	2.91E-07	6.58E-03	2.06E+03	Not applicable	Not applicable	5.25E-05
Zr-95	2.46E-07	1.08E-03	1.00E+02	Ag-110m	2.46E-07	5.56E-03	1.74E+03	Not applicable	Not applicable	4.44E-05
Nb-95	2.44E-07	8.29E-04	1.00E+02	Co-58	2.44E-07	5.50E-03	1.72E+03	Not applicable	Not applicable	4.39E-05
Cs-134	2.19E-07	7.87E-04	1.00E+02	Cs-134	2.19E-07	4.96E-03	1.55E+03	Not applicable	Not applicable	3.95E-05
Eu-155	2.15E-07	5.58E-04	1.00E+02	Zn-65	2.15E-07	4.86E-03	1.52E+03	Not applicable	Not applicable	3.88E-05
Co-58	1.38E-07	4.37E-04	1.00E+02	Ag-108m	1.38E-07	3.11E-03	9.70E+02	Not applicable	Not applicable	2.48E-05
Ag-108m	8.67E-08	4.11E-04	1.00E+02	Mn-54	8.67E-08	1.96E-03	6.12E+02	Not applicable	Not applicable	1.56E-05
Zn-65	1.06E-08	1.93E-04	1.00E+02	U-235	1.06E-08	2.38E-04	7.44E+01	Not applicable	4.80E-03	1.90E-06
Mn-54	1.02E-08	1.55E-04	1.00E+02	I-129	1.02E-08	2.30E-04	7.18E+01	Not applicable	Not applicable	1.83E-06
Th-234	9.86E-09	8.84E-05	1.00E+02	U-238	9.86E-09	2.23E-04	6.96E+01	Not applicable	Not applicable	1.78E-06
Pa-233	9.86E-09	8.54E-06	1.00E+02	Th-234	9.86E-09	2.23E-04	6.96E+01	Not applicable	Not applicable	1.78E-06
U-235	6.95E-09	0.00E+00	1.00E+02	Cm-242	6.95E-09	1.57E-04	4.90E+01	Not applicable	Not applicable	1.25E-06
I-129	4.29E-09	0.00E+00	1.00E+02	Np-237	4.29E-09	9.69E-05	3.03E+01	Not applicable	Not applicable	7.73E-07
U-238	4.29E-09	0.00E+00	1.00E+02	Pa-233	4.29E-09	9.69E-05	3.03E+01	Not applicable	Not applicable	7.73E-07

If #DIV/0! occurs in the Fraction of Waste Profile Column or the Does Nuclide Meet Waste Profile? Column of Section III, the nuclide is not included on the current profile and needs to be added.

Waste Classification Determination for near surface disposal per 10 CFR §61.55

Assume that Sr-90, Cs-137, and Ni-63 are major nuclides driving waste classification determination for Tank V-1, V-2, and V-3 wastes

Table 2 limit (Ci/m³)

Radionuclidic Column 1 Column 2 .25" V-3 Sludge in a 6" pipe

Sr-90	0.04	150	5.64E-01
Cs-137	1	44	1.78E-03
Ni-63	3.5	70	1.12E-04
Class A Sum of Fractions:			14.10
Class B Sum of Fractions:			0.00

Class B

17 of 27

Attachment 3

Tank with 17.26 gal Residue

MT Tank with residue <Type A

Container ID # Empty V-Tank with 17.26 gallons of sludge residue

Note: based upon BTP Radioactive Waste Classification (May 1983, Rev.0), the final waste form volume may be used for 10 CFR 61.55 Classification

Section I. Waste Stream Information

Container Type 10,000 gallon stainless steel tank (10' dia. X 19.5' leng 1337 ft³ or

Description: 17.26 gallons of Sludge

Note: assume solid phase volume of 17.26 gallons with density of 1.25 g/cc

Container Container Container Container Waste Est. Waste Vol. Final Waste Vol.

Gross Wt (lb) Gross Wt (kg) Tare Wt (lb) Tare Wt (kg) Net Wt (kg) Net Wt (kg)

180.05 81.67 0.00 0.00 81.67 3.79E+01

1.07E+00 180.05 lbs.

Note: Gross weight of contents = (17.26 gal) x (1.25 g/cc) x (3785.412 cc/gal) x (2.2046E-03 lb/g) =

Section II. List the radionuclides and activities; perform DOT RAM, RQ, LTD QTY, and Type A Packaging checks

Dose survey from Sxxxx on xx/xx/00 shows < mrem/hr OC.

Radioactive liquid effluents from hot cells, labs, and decon facilities at TAN and IETF.

EPA regulated hazardous COCs: Barium, Cadmium, Chromium, Lead, Mercury, Silver, VOCs, S'

Nuclide	Activity (Ci)	% of Total A2 Fraction	Activity (Bq)	Activity/gram (Bq/gram)	RQ limits (TBq)	RQ Ratios (amount/limit)	A2 Value (TBq)	LTD QTY Det. amount/(10-3)A2	Type A Pkg? (amount/A2)	DOT Fissile Mass (g)	TRU Conc. (nCi/g)	LSA-II Solids Frac	Activity/gram (pCi/g)
Sr-90	1.44E+00	5.61E+01	5.33E+10	6.53E+05	3.70E-03	1.44E+01	1.00E-01	5.33E+02	5.33E-01	0.00E+00	0.00E+00	6.53E-02	1.76E+07
Cs-137	5.06E-01	3.95E+00	1.87E+10	2.29E+05	3.70E-02	5.06E-01	5.00E-01	3.75E+02	3.75E-02	0.00E+00	0.00E+00	4.59E-03	6.20E+06
Ni-63	6.36E-02	8.26E-03	2.35E+09	2.88E+04	3.70E+00	6.36E-04	3.00E+01	7.84E-02	7.84E-05	0.00E+00	0.00E+00	9.60E-06	7.79E+05
Co-60	1.25E-02	1.22E-01	4.62E+08	5.65E+03	3.70E-01	1.25E-03	4.00E-01	1.15E+00	1.15E-03	0.00E+00	0.00E+00	1.41E-04	1.53E+05
Pu-241	4.54E-03	1.77E+00	1.68E+08	2.06E+03	3.70E-02	4.54E-03	1.00E-02	1.68E+01	1.68E-02	4.54E-05	0.00E+00	2.06E-04	5.56E+04
Eu-154	2.09E-03	1.63E-02	7.75E+07	9.49E+02	3.70E-01	2.09E-04	5.00E-01	1.55E-01	1.55E-04	0.00E+00	0.00E+00	1.90E-05	2.56E+04
Eu-152	1.22E-03	5.28E-03	4.51E+07	5.52E+02	3.70E-01	1.22E-04	9.00E-01	5.01E-02	5.01E-05	0.00E+00	0.00E+00	6.14E-06	1.49E+04
Ru-103	1.09E-03	4.70E-03	4.02E+07	4.92E+02	3.70E-01	1.09E-04	9.00E-01	4.47E-02	4.47E-05	0.00E+00	0.00E+00	5.47E-06	1.33E+04
Ce-144	8.99E-04	1.75E-02	3.33E+07	4.07E+02	3.70E-02	8.99E-04	2.00E-01	1.66E-01	1.66E-04	0.00E+00	0.00E+00	2.04E-05	1.10E+04
Pu-238	8.89E-04	1.73E-01	3.29E+07	4.03E+02	3.70E-04	8.89E-02	2.00E-04	1.64E+02	1.64E-01	5.23E-05	0.00E+00	2.01E-02	1.09E+04
Ru-106	8.87E-04	1.73E-02	3.28E+07	4.02E+02	3.70E-02	8.87E-04	2.00E-01	1.64E-01	1.64E-04	0.00E+00	0.00E+00	2.01E-05	1.09E+04
Am-241	4.77E-04	9.29E+00	1.77E+07	2.16E+02	3.70E-04	4.77E-02	2.00E-04	8.83E+01	8.83E-02	0.00E+00	5.84E+00	1.08E-02	5.84E+03
Pu-239	4.59E-04	8.95E+00	1.70E+07	2.08E+02	3.70E-01	4.59E-02	2.00E-04	8.50E+01	8.50E-02	7.41E-03	5.62E+00	1.04E-02	5.62E+03
Sb-125	3.57E-04	1.55E-03	1.32E+07	1.62E+02	3.70E-01	3.57E-05	2.00E+00	1.47E-02	1.47E-05	0.00E+00	0.00E+00	1.80E-06	4.38E+03
Eu-155	2.87E-04	5.58E-04	1.06E+07	1.30E+02	3.70E-01	2.87E-05	2.00E+00	1.47E-02	1.47E-05	0.00E+00	0.00E+00	6.49E-07	3.51E+03
Zr-95	2.45E-04	1.06E-03	9.08E+06	1.11E+02	3.70E-01	2.45E-05	9.00E-01	1.01E-02	1.01E-05	0.00E+00	0.00E+00	1.24E-06	3.00E+03
Nb-95	2.13E-04	8.29E-04	7.87E+06	9.64E+01	3.70E-01	2.13E-05	1.00E+00	7.87E-03	7.87E-06	0.00E+00	0.00E+00	9.64E-07	2.61E+03
Ra-226	1.94E-04	3.78E-02	7.19E+06	8.80E+01	3.70E-03	1.94E-03	2.00E-02	3.59E-01	3.59E-04	0.00E+00	0.00E+00	4.40E-05	2.38E+03
U-233	1.49E-04	5.79E-01	5.50E+06	6.74E+01	3.70E-03	1.49E-03	1.00E-03	5.50E+00	5.50E-03	1.53E-02	0.00E+00	6.74E-04	1.82E+03
Cm-243	1.34E-04	1.74E+00	4.96E+06	6.07E+01	3.70E-04	1.34E-02	3.00E-04	1.65E+01	1.65E-02	0.00E+00	1.64E+00	2.02E-03	1.64E+03
Ag-110m	1.13E-04	1.10E-03	4.19E+06	5.13E+01	3.70E-01	1.13E-05	4.00E-01	1.05E-02	1.05E-05	0.00E+00	0.00E+00	1.28E-06	1.39E+03
Co-58	1.12E-04	4.37E-04	4.15E+06	5.08E+01	3.70E-01	1.12E-05	1.00E+00	4.15E-03	4.15E-06	0.00E+00	0.00E+00	5.08E-07	1.37E+03
Cs-134	1.01E-04	7.87E-04	3.74E+06	4.58E+01	3.70E-02	1.01E-04	5.00E-01	7.47E-03	7.47E-06	0.00E+00	0.00E+00	9.15E-07	1.24E+03
Zn-65	9.90E-05	1.93E-04	3.66E+06	4.49E+01	3.70E-01	9.90E-06	2.00E+00	1.83E-03	1.83E-06	0.00E+00	0.00E+00	2.24E-07	1.21E+03
Mn-54	6.33E-05	4.11E-04	2.34E+06	2.87E+01	3.70E-01	6.33E-06	6.00E-01	3.90E-03	3.90E-06	0.00E+00	0.00E+00	4.78E-07	7.75E+02
U-235	4.86E-06	0.00E+00	1.80E+05	2.20E+00	3.70E-01	3.99E-06	1.00E+00	1.48E-03	1.48E-06	0.00E+00	0.00E+00	1.81E-07	4.89E+02
I-129	4.69E-06	0.00E+00	1.73E+05	2.12E+00	3.70E-05	4.66E-05	Unlimited	0.00E+00	0.00E+00	2.21E+00	0.00E+00	0.00E+00	5.95E+01
U-238	4.54E-06	0.00E+00	1.68E+05	2.06E+00	3.70E-03	4.54E-05	Unlimited	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.74E+01
Th-234	4.54E-06	8.84E-05	1.68E+05	2.06E+00	3.70E+00	4.54E-08	2.00E-01	8.40E-04	8.40E-07	0.00E+00	0.00E+00	1.03E-07	5.56E+01
Cm-242	3.20E-06	1.25E-03	1.18E+05	1.45E+00	3.70E-02	3.20E-06	1.00E-02	1.18E-02	1.18E-05	0.00E+00	0.00E+00	1.45E-06	3.92E+01
Np-237	1.97E-06	3.84E-02	7.30E+04	8.94E-01	3.70E-04	1.97E-04	2.00E-04	3.65E-01	3.65E-04	0.00E+00	2.42E-02	4.47E-05	2.42E+01
Pa-233	1.97E-06	8.54E-06	7.30E+04	8.94E-01	3.70E+00	1.97E-08	9.00E-01	8.12E-05	8.12E-08	0.00E+00	0.00E+00	9.94E-09	2.42E+01
Total	2.04E+00	100.00%	7.54E+10	9.23E+05		1.51E+01		9.50E+02	9.50E-01	2.23E+00	2.40E+01	1.16E-01	2.50E+07

DOT regulated as Hazard Class 7 Radioactive Material

Contains a Reportable Quantity of a Hazardous Substance; use 'RQ(radionuclides)' as part of PSN

< Type A quantity/package per 49 CFR 173.431(a); check if excepted quantity -> excepted packaging

Does NOT meet LTD QTY Exception; Check if LSA

Performed by:

Date:

Meets specific Activity (LSA)-II material - Check <Type A quantity and use Radioactive material LSA, n.o.s. as PSN
Meets criteria for Fissile Excepted Package per 49 CFR 173.453
This is a Low-level waste

Date:

Reviewed by:

Section III: Check radionuclides for listing on labels and shipping papers; Check reportable radionuclides per Envirocare WAC

Nuclide	Activity (Ci)	% of Total	A2 Fraction	Cumulative A2 Fraction	Nuclide	Activity (Ci)	% of Total	Activity Conc. (pCi/g)	Source Material (kg)	SNM (g)	Activity Conc. (Ci/m ³)
Sr-90	1.44E+00	5.61E+01	5.61E+01	5.61E+01	Sr-90	1.44E+00	7.07E+01	1.76E+07	Not applicable	Not applicable	3.81E-02
Pu-238	8.89E-04	1.73E+01	7.34E+01	7.34E+01	Cs-137	5.06E-01	2.48E+01	6.20E+06	Not applicable	Not applicable	1.34E-02
Am-241	4.77E-04	9.29E+00	8.27E+01	8.27E+01	Ni-63	6.36E-02	3.12E+00	7.79E+05	Not applicable	Not applicable	1.88E-03
Pu-239	4.59E-04	8.95E+00	9.17E+01	9.17E+01	Co-60	1.25E-02	6.12E-01	1.53E+05	Not applicable	Not applicable	3.30E-04
Cs-137	5.06E-01	3.95E+00	9.56E+01	9.56E+01	Pu-241	4.54E-03	2.23E-01	5.56E+04	Not applicable	4.54E-05	1.20E-04
Pu-241	4.54E-03	1.77E+00	9.74E+01	9.74E+01	Eu-154	2.09E-03	1.03E-01	2.56E+04	Not applicable	Not applicable	5.53E-05
Cm-243	1.34E-04	1.74E+00	9.91E+01	9.91E+01	Eu-152	1.22E-03	5.98E-02	1.49E+04	Not applicable	Not applicable	3.22E-05
U-233	1.49E-04	5.79E-01	9.97E+01	9.97E+01	Ru-103	1.09E-03	5.33E-02	1.33E+04	Not applicable	Not applicable	2.87E-05
Co-60	1.25E-02	1.22E-01	9.98E+01	9.98E+01	Ce-144	8.99E-04	4.41E-02	1.10E+04	Not applicable	Not applicable	2.37E-05
Np-237	1.97E-06	3.84E-02	9.99E+01	9.99E+01	Pu-238	8.89E-04	4.36E-02	1.09E+04	Not applicable	5.23E-05	2.35E-05
Ra-226	1.94E-04	3.78E-02	9.99E+01	9.99E+01	Ru-106	8.87E-04	4.35E-02	1.09E+04	Not applicable	Not applicable	2.34E-05
Ce-144	8.99E-04	1.75E-02	9.99E+01	9.99E+01	Am-241	4.77E-04	2.34E-02	5.84E+03	Not applicable	Not applicable	1.26E-05
Eu-106	8.87E-04	1.73E-02	1.00E+02	1.00E+02	Pu-239	3.57E-04	1.75E-02	5.82E+03	Not applicable	7.41E-03	1.21E-05
Eu-154	2.09E-03	1.63E-02	1.00E+02	1.00E+02	Sb-125	3.57E-04	1.75E-02	5.82E+03	Not applicable	Not applicable	9.44E-06
Ni-63	6.36E-02	8.26E-03	1.00E+02	1.00E+02	Eu-155	2.87E-04	1.41E-02	3.51E+03	Not applicable	Not applicable	7.57E-06
Eu-152	1.22E-03	5.28E-03	1.00E+02	1.00E+02	Zr-95	2.45E-04	1.20E-02	3.00E+03	Not applicable	Not applicable	8.48E-06
Ru-103	1.09E-03	4.70E-03	1.00E+02	1.00E+02	Nb-95	2.13E-04	1.04E-02	2.61E+03	Not applicable	Not applicable	5.82E-06
Sb-125	3.57E-04	1.55E-03	1.00E+02	1.00E+02	Ra-226	1.94E-04	9.53E-03	2.38E+03	Not applicable	Not applicable	5.13E-06
Cm-242	3.20E-06	1.25E-03	1.00E+02	1.00E+02	U-233	1.49E-04	7.30E-03	1.82E+03	Not applicable	1.53E-02	3.93E-06
Ag-110m	1.13E-04	1.10E-03	1.00E+02	1.00E+02	Cm-243	1.34E-04	6.58E-03	1.64E+03	Not applicable	Not applicable	3.54E-06
Zr-95	2.45E-04	1.06E-03	1.00E+02	1.00E+02	Ag-110m	1.13E-04	5.56E-03	1.39E+03	Not applicable	Not applicable	2.99E-06
Nb-95	2.13E-04	8.29E-04	1.00E+02	1.00E+02	Co-58	1.12E-04	5.50E-03	1.37E+03	Not applicable	Not applicable	2.96E-06
Cs-134	1.01E-04	7.87E-04	1.00E+02	1.00E+02	Cs-134	1.01E-04	4.96E-03	1.24E+03	Not applicable	Not applicable	2.67E-06
Eu-155	2.87E-04	5.58E-04	1.00E+02	1.00E+02	Zn-65	9.90E-05	4.86E-03	1.21E+03	Not applicable	Not applicable	2.82E-06
Co-58	1.12E-04	4.37E-04	1.00E+02	1.00E+02	Ag-108m	6.33E-05	3.11E-03	7.75E+02	Not applicable	Not applicable	1.67E-06
Ag-108m	6.33E-05	4.11E-04	1.00E+02	1.00E+02	Mn-54	3.99E-05	1.96E-03	4.89E+02	Not applicable	Not applicable	1.05E-06
Zn-65	9.90E-05	1.93E-04	1.00E+02	1.00E+02	U-235	4.86E-06	2.38E-04	5.95E+01	Not applicable	2.21E+00	1.28E-07
Mn-54	3.99E-05	1.55E-04	1.00E+02	1.00E+02	I-129	4.69E-06	2.30E-04	5.74E+01	Not applicable	Not applicable	1.24E-07
Th-234	4.54E-06	8.84E-05	1.00E+02	1.00E+02	U-238	4.54E-06	2.23E-04	5.56E+01	Not applicable	Not applicable	1.20E-07
Pa-233	1.97E-06	8.54E-06	1.00E+02	1.00E+02	Th-234	4.54E-06	2.23E-04	5.56E+01	Not applicable	Not applicable	1.20E-07
U-235	4.86E-06	0.00E+00	1.00E+02	1.00E+02	Cm-242	3.20E-06	1.57E-04	3.92E+01	Not applicable	Not applicable	8.44E-08
I-129	4.69E-06	0.00E+00	1.00E+02	1.00E+02	Np-237	1.97E-06	9.69E-05	2.42E+01	Not applicable	Not applicable	5.21E-08
U-238	4.54E-06	0.00E+00	1.00E+02	1.00E+02	Pa-233	1.97E-06	9.69E-05	2.42E+01	Not applicable	Not applicable	5.21E-08

If #DIV/0! occurs in the Fraction of Waste Profile Column or the Does Nuclide Meet Waste Profile? Column of Section III, the nuclide is not included on the current profile and needs to be added.
Waste Classification Determination for near surface disposal per 10 CFR 61.55

Assume that Sr-90, Cs-137, and Ni-63 are major nuclides driving waste classification determination for Tank V-1, V-2, and V-3 wastes

Table 2 limit (Ci/m³)

Radionuclide Column 1 Column 2 2" heel and .25" residue of V-3 Sludge in a 10,000 gallon steel tank

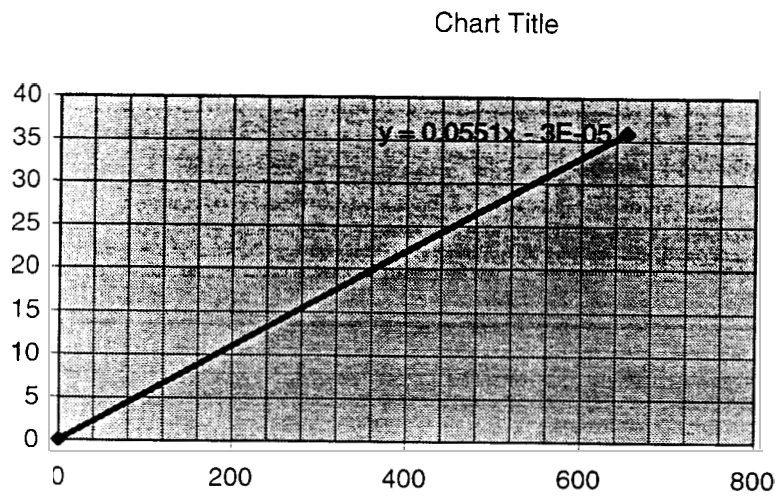
Sr-90	0.04	150	3.81E-02
Cs-137	1	44	1.20E-04
Ni-63	3.5	70	7.57E-06

Class A Sum of Fractions: 0.95

Class B Sum of Fractions: 0.00

Class A

x	y
652	35.9
0.038	0.00206



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Attachment 4

Volume and Weight Calculation for 4 and 6 Inch Pipe

CLIENT/SUBJECT U-TANKS

W.O. NO. _____

TASK DESCRIPTION Determine Pipe Wts / LF

TASK NO. _____

PREPARED BY R. KESHIAN

DEPT _____

DATE 9/24/01

APPROVED BY _____

MATH CHECK BY _____

DEPT _____

DATE _____

METHOD REV. BY _____

DEPT _____

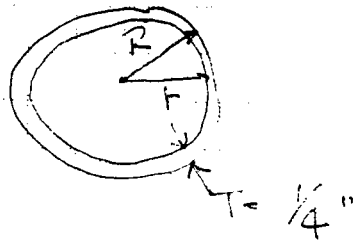
DATE _____

DEPT _____ DATE _____

1. Determine weight per linear ft for both 4" and 6" stainless steel pipe

• Assume pipe is 1/4" thick

$$A = \pi (R^2 - r^2) \quad \text{or} \quad \frac{\pi (D^2 - d^2)}{4}$$



Density of Stainless Steel is 496 #/CF @ 30°C

USE 495 #/CF

4" Pipe

$$A = \frac{\pi}{4} \left(\left(\frac{4.25}{12} \right)^2 - \left(\frac{4}{12} \right)^2 \right) = .0112 \text{ SF}$$

$$\times 1 \text{ FT} \times 495 \text{ #/CF} = \underline{5.55 \text{ #/LF}}$$

6" Pipe

$$A = \frac{\pi}{4} \left(\left(\frac{6.25}{12} \right)^2 - \left(\frac{6}{12} \right)^2 \right) = .0168 \text{ SF}$$

$$\times 1 \times 495 \text{ #/CF} = \underline{8.37 \text{ #/LF}}$$

CLIENT/SUBJECT	<u>1/ TANKS</u>		W.O. NO.	
TASK DESCRIPTION	<u>Determine wt & Vol of Contamination in Pipes</u>		TASK NO.	
PREPARED BY	<u>B. ESHAW</u>	DEPT	DATE	<u>9/22/01</u>
MATH CHECK BY		DEPT	DATE	
METHOD REV. BY		DEPT	DATE	

APPROVED BY

DEPT _____ DATE _____

1. Determine wt and Vol of Contamination remaining in pipes as Surface Contamination
 - For All pipe Assume $\frac{1}{4}$ " of Contamination remains
 - Assume wt of Contamination = 1.25 gm/cc
or 72 #/cc

4" PIPE

$$A = \frac{\pi}{4} \left(\left(\frac{4}{12} \right)^2 - \left(\frac{3.75}{12} \right)^2 \right) = .0106 \text{ SF}$$

$$\text{WT} = 1 \times .0106 \times 72 = .83 \text{ #/LF of Contamination}$$

6" Pipe

$$A = \frac{\pi}{4} \left(\left(\frac{6}{12} \right)^2 - \left(\frac{5.75}{12} \right)^2 \right) = 0.160 \text{ SF}$$

$$\text{WT} = 1 \times .16 \times 72 = 1.25 \text{ #/LF}$$

Attachment 5

Volume and Weight of V-Tanks and Contamination Prior to
Removal from the Ground

CLIENT/SUBJECT V TANKS W.O. NO. _____

TASK DESCRIPTION Determine wt of TANKS TASK NO. _____

PREPARED BY B. BISHIAN DEPT _____ DATE 9/24/01

MATH CHECK BY _____ DEPT _____ DATE _____

METHOD REV. BY _____ DEPT _____ DATE _____

APPROVED BY	
DEPT _____	DATE _____

Determine wt of TANKS

DIA 10'
length 19'-6"

Thickness 1/4"

$$A = \pi (\underline{5.021^2} - 5^2) \times 19.5 \times 12.78 \# / \text{LF} \times 495 \# / \text{CF}$$

$$\text{WT} = 6327.5 \#$$

WT of TANK ends

$$2 \times 10' \text{ DIA} \times \pi \times \frac{.25}{12} \times 495 = 647.62$$

$$\text{TOTAL WT / TANK} = 6975.12$$

ADD for Riser pipes, Flanges, manholes 200 lbs

CLIENT/SUBJECT V TANKS W.O. NO. _____

TASK DESCRIPTION _____ TASK NO. _____

PREPARED BY B KESHIAN DEPT _____ DATE 9/25/01

MATH CHECK BY _____ DEPT _____ DATE _____

METHOD REV. BY _____ DEPT _____ DATE _____

APPROVED BY	
DEPT _____	DATE _____

Determine WT of Contamination remaining in TANKS
As surface contamination & here/

- Assume $\frac{1}{4}"$ of Contamination on interior of tank
- Assume 3" of sludge on Bottom of Tank cannot be removed

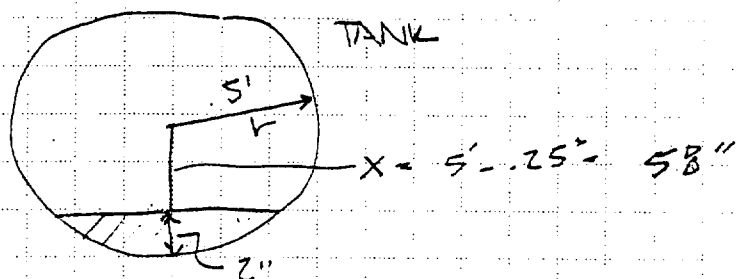
DIA = 10'

Assume density of 78 #/CF

L = 19.5'

$$A = \pi \left(5^2 - \left(\frac{59.75}{12} \right)^2 \right) = .653 \text{ SF}$$

$$\times 19.5' \times 78 \text{ #/CF} = \boxed{993 \text{ # Contamination}}$$



$$A = \frac{\pi r^2}{2} - \left[x \sqrt{r^2 - x^2} + r^2 \sin^{-1} \left(\frac{x}{r} \right) \right]$$

OR

CLIENT/SUBJECT V TANKS W.O. NO. _____

TASK DESCRIPTION _____ TASK NO. _____

PREPARED BY B. K. Sharma DEPT _____ DATE 9/25/01

MATH CHECK BY _____ DEPT _____ DATE _____

METHOD REV. BY _____ DEPT _____ DATE _____

APPROVED BY	
DEPT _____	DATE _____

Area of Segment

$$= \frac{\pi r^2 \theta}{360} - \frac{r^2 \sin \theta}{2}$$

$$\theta = 180 - [2 \sin^{-1}(\frac{x}{r})]$$

$$= 180 - 150.33$$

$$= 29.67^\circ$$

$$= \frac{3.14 \times 25 \times 29.67}{360} - \frac{25 \sin 29.67}{2}$$

$$= 6.47 - 6.19 = .28 \text{ SF}$$

$$\times 19.5 \text{ ft} = 5.5 \text{ cf}$$

$$\times 7.48 \text{ gal/cf} = 41.16 \text{ gal}$$

or

$$5.5 \times 78 = 429 \text{ \# of Sludge}$$